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U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE

TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371

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INTERNATIONAL APPLICATION NO.	INTERNATIONAL FILING DATE	PRIORITY DATE CLAIMED
PCT/DE00/02109	28 June 2000	30 June 1999

TITLE OF INVENTION
METHOD OF TRANSMITTING PROGRAM AND/OR OPERATIONAL INFORMATION THAT IS CENTRALLY STORED IN A COMMUNICATION NETWORK TO SEVERAL DECENTRALIZED COMMUNICATION DEVICE

APPLICANT(S) FOR DO/EO/US
Josef-Peter ZUCK et al.

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☒ This is a FIRST submission of items concerning a filing under 35 U.S.C. 371
2. ☒ This is an express request to immediately begin national examination procedures (35 U.S.C. 371(f)).
3. ☒ The US has been elected by the expiration of 19 months from the priority date (PCT Article 31).
4. ☒ A copy of the International Application as filed (35 U.S.C. 371(c)(2))
   a. ☒ is transmitted herewith (required only if not transmitted by the International Bureau).
   b. ☐ has been transmitted by the International Bureau.
   c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US).
5. ☒ A translation of the International Application into English (35 U.S.C. 371(c)(2)).
6. ☐ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3))
   a. ☐ are transmitted herewith (required only if not transmitted by the International Bureau).
   b. ☐ have been transmitted by the International Bureau.
   c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US)
7. ☐ A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
8. ☐ An oath or declaration of the inventor (35 U.S.C. 371(c)(4)).
9. ☐ A translation of the Annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).

Items 10-15 below concern document(s) or information included:

10. ☒ An Information Disclosure Statement Under 37 CFR 1.97 and 1.98.
11. ☐ An assignment document for recording.
    Please mail the recorded assignment document to:
    a. ☐ the person whose signature, name & address appears at the bottom of this document.
    b. ☐ the following:
12. ☒ A preliminary amendment.
13. ☒ A substitute specification
14. ☐ A change of power of attorney and/or address letter.
15. ☒ Other items or information: First page of published International Application with Translation; International Search Report; and International Preliminary Examination Report.

10/019480

JC13 Rec'd PCT/PTO 31 DEC 2001

☒ The U.S. National Fee (35 U.S.C. 371(c)(1)) and other fees as follows:

CLAIMS	(1) FOR	(2) NUMBER FILED	(3) NUMBER EXTRA	(4) RATE	(5) CALCULATIONS
	TOTAL CLAIMS	29 -20=	9	x $ 18.00	162.00
	INDEPENDENT CLAIMS	4 -3=	1	x $ 84.00	84.00
	MULTIPLE DEPENDENT CLAIM(S) (if applicable)			+$280.00	0.00
	BASIC NATIONAL FEE (37 CFR 1.492(a)(1)-(4): ☐ Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO .....$1,040 ☒ International preliminary examination fee (37 C.F.R. 1.482) not paid to USPTO but International Search Report prepared by the EPO or JPO.....$ 890 ☐ International preliminary examination fee (37 C.F.R. 1.482) not paid to USPTO but international search fee (37 C.F.R. 1.445(a)(2) paid to USPTO...$ 740 ☐ International preliminary examination fee paid to USPTO (37 CFR 1.482) but all claims did not satisfy provision of PCT Article 33(1)-(4).....$ 710 ☐ International preliminary examination fee paid to USPTO (37 CFR 1.482) and all claims satisfied provisions of PCT Article 33(2) to (4) .....$ 100				890.00
	Surcharge of $130 for furnishing the National fee or oath or declaration later than ☐ 20 ☐ 30 mos. from the earliest claimed priority date (37 CFR 1.482(e)).				0.00
			TOTAL OF ABOVE CALCULATIONS		1136.00
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			SUBTOTAL		1136.00
	Processing fee of $130 for furnishing the English Translation later than [ ] 20 [ ] 30 mos. from the earliest claimed priority date (37 CFR 1.482(f)).				
			TOTAL NATIONAL FEE		1136.00
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			TOTAL FEES ENCLOSED		1136.00

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21171
PATENT TRADEMARK OFFICE

SUBMITTED BY: STAAS & HALSEY LLP

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(Bitte entsprechende Informationen und Unterschriften im Falle von dritten und weiteren Miterfindern angeben).

(Supply similar information and signature for third and subsequent joint inventors).

Docket No.: 1454.1213

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of:

PCT National Phase Application: PCT/DE00/02109

Josef-Peter ZUCK et al.

Serial No. Group Art Unit: To be assigned

Confirmation No.

Filed: Examiner: To be assigned

For: METHOD OF TRANSMITTING PROGRAM AND/OR OPERATIONAL INFORMATION THAT IS CENTRALLY STORED IN A COMMUNICATION NETWORK TO SEVERAL DECENTRALIZED COMMUNICATION DEVICE

PRELIMINARY AMENDMENT

Assistant Commissioner for Patents
Washington, D.C. 20231

Sir:

Before examination of the above-identified application, please amend the application as follows:

IN THE ABSTRACT:

Please REPLACE the Abstract originally filed with the enclosed Substitute Abstract attached hereto.

IN THE SPECIFICATION:

Please REPLACE the specification originally filed with the enclosed Substitute Specification.

IN THE CLAIMS:

Please CANCEL claims 1-26.

Please ADD new claims 27-55 in accordance with the following:

27. (NEW) A method for transmitting program and/or operating information which is stored centrally in a communications network and transmitted to a feeder device, to a number of decentralized communications devices linked to the feeder device, comprising:

inserting the program and/or operating information, which is transmitted to the feeder device, into broadcast transmission messages ;

transmitting the broadcast messages to the decentralized communications devices via at least one broadcast transmission channel ; and

matching the program and/or operating information to transmission characteristics of the at least one broadcast transmission channel .

28. (NEW) The method as claimed in claim 27, wherein the program and/or operating information is matched in the communications network.

29. (NEW) The method as claimed in claim 27, wherein the program and/or operating information is matched in the feeder device.

30. (NEW) The method as claimed in claim 27, wherein

the program and/or operating information which is transmitted to the feeder device is temporarily stored in the feeder device, and

the program and/or operating information which is temporarily stored in the feeder device is transmitted to the decentralized communications devices .

31. (NEW) The method as claimed in claim 27, wherein the program and/or operating information which is transmitted to the decentralized communications devices is stored in the decentralized communications devices .

32. (NEW) The method as claimed in claim 30, wherein the program and/or operating information is transmitted via point-to-point connections or via at least one point-to-multipoint connection, to the decentralized communications devices .

33. (NEW) The method as claimed in claim 32, wherein, in the case of a point-to-point or point-to-multipoint connection, the program and/or operating information is transmitted via one or more parallel user channels.

34. (NEW) The method as claimed in claim 30, wherein the temporarily stored program and/or operating information is transmitted to the decentralized communications devices by broadcast transmission messages which are transmitted to the decentralized communications devices via the at least one broadcast transmission channel .

35. (NEW) The method as claimed in claim 27, wherein the program and/or operating information is transmitted to the feeder unit from a network administration unit which is arranged centrally in the communications network .

36. (NEW) The method as claimed in claim 35, wherein transmission of the program and/or operating information to the decentralized communications devices is in each case controlled by the network administration unit .

37. (NEW) The method as claimed in claim 27, wherein a control program of the program and/or operating information, is stored in the decentralized communications devices and then initialized .

38. (NEW) The method as claimed in claim 35, wherein

a control program of the program and/or operating information, is stored in the decentralized communications devices and then initialized, and

initialization is controlled by the network administration unit .

39. (NEW) The method as claimed in claim 37, wherein information which indicates initialization of the control program is transmitted from the decentralized communications devices to the network administration unit .

40. (NEW) The method as claimed in claim 27, wherein

the feeder device comprises at least one feeder network access device and at least one feeder network device which are connected to one another via at least one user channel and at least one signaling channel.

41. (NEW) The method as claimed in claim 40, wherein

the program and/or operating information is temporarily stored in the feeder network

access device or in the feeder network device, and

the program and/or operating information is transmitted from the feeder network device to the decentralized communications devices .

42. (NEW) The method as claimed in claim 40, wherein the program and/or operating information is transmitted via the at least one user channel from the feeder network access device to the at least one feeder network device .

43. (NEW) The method as claimed in claim 40, wherein

the at least one feeder network device and the decentralized communications devices are in the form of wireless devices, and

the decentralized communications devices and the at least one feeder network device are connected to one another via a wireless transmission medium which has at least one user channel and at least one signaling or broadcast transmission channel .

44. (NEW) The method as claimed in claim 43, wherein the program and/or operating information is temporarily stored in the feeder network device and transmitted from the feeder network device to the decentralized, wireless communications devices:

by the least one user channel in the wireless transmission medium, in each case in the course of point-to-point connections or a point-to-multipoint connection, or

by broadcast transmission messages which are transmitted via the signaling or broadcast transmission channel in the wireless transmission medium .

45. (NEW) The method as claimed in claim 44, wherein the process of setting up the point-to-point connections or the point-to-multipoint connection for transmitting the program and/or operating information is controlled by a network administration unit, which transmits the program and/or operating information to the feeder device .

46. (NEW) The method as claimed in claim 43, wherein the wireless transmission medium is provided by at least one of a TDM-/TDMA transmission method, an FDMA transmission method, a CDMA transmission method and an Orthogonal Frequency Division Multiplexing transmission method.

47. (NEW) The method as claimed in claim 46, wherein the wireless devices and the

wireless transmission medium are designed

in accordance with the international DECT Standard ETS 300 175, or

in accordance with the GSM or UMTS Standard, or

in accordance with a future mobile radio standard, or

in accordance with a B-CDMA transmission method.

48. (NEW) The method as claimed in claim 43, wherein the feeder network access device is connected to a higher-level communications network.

49. (NEW) The method as claimed in claim 27, wherein the program and/or operating information is transmitted in a segmented form or in a packet form to the decentralized communications devices .

50. (NEW) The method as claimed in claim 27, wherein the program and/or operating information is transmitted in a compressed form to the decentralized communications devices .

51. (NEW) A communications system having a network administration unit, in which a memory is arranged with program and/or operating information stored in it, comprising:

a feeder device which is connected to the network administration unit,

a transmitter arranged in the network administration unit, to transmit the program and/or operating information to the feeder device,

a plurality of decentralized communications devices linked to the feeder device, and

memories arranged in the decentralized communications devices to store the program and/or operating information, and

an insertion and transmission unit provided in the feeder device to insert the program and/or operating information into broadcast transmission messages and transmit the broadcast transmission messages to the decentralized communications devices via at least one broadcast transmission channel,

wherein the transmitter arranged in the network administration unit matches the program and/or operating information to the transmission characteristics of the at least one broadcast transmission channel .

52. (NEW) A communications system having a network administration unit, in which a memory is arranged with program and/or operating information stored in it, comprising:

a feeder device which is connected to the network administration unit,

a transmitteer arranged in the network administration unit, to transmit the program and/or operating information to the feeder device,

a plurality of decentralized communications devices linked to the feeder device, and

memories arranged in the decentralized communications devices to store the program and/or operating information, wherein

a buffer is] provided in the feeder device, for temporary storage of the program and/or operating information which is transmitted to the feeder device, and

a transmitter provided in the feeder device to transmit the temporarily stored program and/or operating information to the decentralized communications devices .

53. (NEW) The communications system as claimed in claim 52, wherein the transmitter in the feeder device transmits the temporarily stored program and/or operating information to the decentralized communications devices :

in the course of point-to-point connnections or in the course of at least one point-to-multipoint connection, or

by broadcast transmission messages which are transmitted to the decentralized communications devices via at least one broadcast transmission channel .

54. (NEW) The communications system as claimed in claim 53, wherein the feeder device comprises at least one feeder network access device and at least one feeder network device which are connected to one another via at least one user channel and at least one signaling channel.

55. (NEW) A method for transmitting updating information, comprising:

matching the updating information to transmission characteristics of a broadcast transmission channel; and

transmitting the updating information to a plurality of decentralized communications devices over the broadcast transmission channel.

REMARKS

This Preliminary Amendment is submitted to improve the form of the specification as originally-filed. A substitute specification and marked-up copy of the original specification are enclosed. No new matter is added to these documents.

It is respectfully requested that this Preliminary Amendment be entered in the above-referenced application.

If any further fees are required in connection with the filing of this Preliminary Amendment, please charge same to our Deposit Account No. 19-3935.

Respectfully submitted,

STAAS & HALSEY LLP

Date: Dec. 31, 2001

By: ______________________
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SUBSTITUTE ABSTRACT

Program and/or operating information which is updated and is stored centrally in a communications network is transmitted to a feeder device, in which it is temporarily stored, and is then transmitted to a number of decentralized communications devices. Alternatively, the program information is transmitted to the decentralized communications devices by means of broadcast transmission messages, without any temporary storage. This advantageously results in a considerable reduction in the time involved in carrying out a software update within the communications network.

SUBSTITUTE SPECIFICATION

TITLE OF THE INVENTION

METHOD OF TRANSMITTING PROGRAM AND/OR OPERATIONAL INFORMATION THAT IS CENTRALLY STORED IN A COMMUNICATION NETWORK TO SEVERAL DECENTRALIZED COMMUNICATION DEVICE

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] This application is based on and hereby claims priority to German Application No. 199 30 170.0 filed on June 30, 1999 in Germany, and PCT Application No. PCT/DE00/02109 filed June 28, 2000, the contents of which are hereby incorporated by reference.

BACKGROUND OF THE INVENTION

[0002] In wireless communications networks, which are based on radio channels, in particular in point-to-multipoint radio feeder networks - which are also referred to as "radio in the local loop" or "RLL", or "Wireless Local Loop" or "WLL" – a number of decentralized network termination units and/or decentralized communications devices which are in the form of network termination units are each connected via one or more radio channels to a base station – which is also referred to as a "Radio Base Station" or "RBS", or as a "Radio Carrier Station" or "RCS". By way of example, the document "DECTlink Radio Access: Where Performance Counts", 1996, Siemens Aktiengesellschaft and the document "CDMAlink A Winner in any Terrain", 1997, Siemens Aktiengesellschaft describe WLL feeder systems which are designed for wireless voice and data communication.

[0003] The feeder systems described in the documents each represent a wireless subscriber connection which can be produced in a short time and without major effort, instead of laying wire connecting lines. The decentralized, wireless communications units RMT allocated to the individual subscribers are each connected via the "radio channel" transmission medium to a feeder device, which is connected to a higher-level communications network PSTN, for example to the ISDN-oriented landline network ISDN. The wireless radio channels are designed in accordance with the DECT Standard or in accordance with the CDMA transmission method. The feeder device comprises at least one central feeder network device RBS or RCS, which in each case terminates the air interface of the feeder network and represents a base station, and at least one feeder network access device RDU, which provides the connection to the higher-level communications network. The central feeder network device and the feeder network access device are connected to one another via copper lines, optical waveguides or directional

radio links. The information to be transmitted is transmitted, for example, based on the HDSL transmission technology – High-bit Rate Digital Subscriber Line – at a data transmission rate of for example 2 Mbits/s – also referred to as a "2 Mbits/s Link" -, with the HDSL connection comprising a number of 64 kbits user channels and a 64 kbits signaling channel which is used jointly by all the decentralized communications devices. The signaling information for all the decentralized network termination units and decentralized communications devices arranged in the radio area of the feeder device is transmitted from the feeder network access device, to the central feeder network device via the signaling channel.

[0004] The feeder network access device is connected to the higher-level ISDN communications network via a standardized interface in accordance with the V5.1 or V5.2 Standard. The feeder network access device is connected via a network administration interface to a central network administration device – referred to as an "ONMS AccessIntegrator" in the cited documents. The network administration interface may, for example, be in the form of a Q interface or a QD2 interface. The central network administration unit provides all the functions for operating the feeder device and for operating the feeder network, as well as for its administration and maintenance – also referred to as OAM functions (Operation, Administration, Maintenance). The OAM information required for controlling and carrying out the OAM functions is, for example, transmitted using a QD2 protocol via the QD2 interface, or using an SNMP protocol (Simple Network Management Protocol) via a TMN interface (Telecommunications Management Network) or OAM interface to the feeder device.

[0005] By way of example, in the case of maintenance processes which need to be carried out in current WLL feeder systems, updated operating parameters and operating information, or updated versions of control or operating programs, must be transmitted from the centrally arranged network administration device via the feeder device to the decentralized communications devices which are arranged in the radio area of the feeder device. The methods used in current WLL feeder systems – for example CDMALink or DECTLink from the Siemens Company – for transmitting updated program and/or operating information – also referred to in the following text as software download or software updating – are based on purely sequential transmission of the updated information from the central network administration device to the individual decentralized communications devices via the feeder device. In this case, point-to-point connection is in each case set up from the central network

administration device to the respective decentralized communications device to be updated, and the current program information is then transmitted via the QD2 interface.

[0006] The WLL feeder systems have the disadvantage that the transmission capacity which can be used for a software download is restricted by a number of capacity constraints – also referred to as bottlenecks:

[0007] The network administration device provides a data transmission rate of 64 kbits/s via the QD2 interface for transmitting OAM information and updated program and operating information to the feeder network access device. The data transmission rate of the QD2 interface cannot be increased.

[0008] In the course of a software download, only the transmission capacity of the 64 kbits/s signaling channel in the HDSL connection is available for transmitting the updated information from the feeder network access device to the feeder network device. Since all the signaling information which occurs at any given time for the decentralized communications devices which are arranged in the radio area of the feeder device – also referred to as "IV5 signaling information" must be transmitted via this signaling channel – also referred to as the "IV5 C channel" in the following text – only a portion of the transmission capacity of the IV5 C channel – approximately 5 kbits/s – can be used for a software download. This represents a very major capacity constraint for transmitting updated program information from the network administration unit to the decentralized communications devices.

[0009] The program information which is transmitted via the IV5 C channel in the HDSL connection to the central feeder network device is then transmitted on the air interface via a special OW signaling channel – referred to as the "order wire channel" or "OW channel" in DECT link and CDMA link systems – together with the respective up-to-date signaling information to the decentralized communications devices. The OW signaling channel uses a data transmission rate of 16 kbits/s.

[0010] A further constraint on the transmission capacity for the purposes of a software download is represented by a confirmation mechanism, which is implemented in layer 7 of the OSI reference model, for point-to-point connections which pass via the QD2 interface, as a result of which the OAM information or program information which is transmitted via the QD2 interface is segmented. In order to minimize the signaling information originating from the

subscribers, the segment size is defined to be 256 bytes, which is also applicable to the transmission of program information via the QD2 interface.

[0011] With regard to the capacity constraints, the data transmission rate which can be used for a software download or for software updating for a point-to-point connection between the network administration unit and the respective decentralized communications device is restricted to approximately 5 kbits/s. This means that, for software updating, in which, for example, program information amounting to 440 bytes of data must be transmitted to each decentralized communications device which is arranged in the radio area of the feeder device, only 3 to 6 decentralized communications devices can be updated within one hour. Thus, assuming a working day of 8 hours, approximately 80 days are required for software updating of a WLL feeder system of the full extent, with 1920 connected subscribers. It is thus impossible with the previously known methods to supply all the decentralized communications devices in a WLL feeder system of the full extent with, for example, an updated software version in an acceptable time. In addition, in the case of a software download, the signaling channels of the WLL feeder system are permanently overloaded, which has a negative influence on operating stability and the performance of the WLL feeder system.

SUMMARY OF THE INVENTION

[0012] One aspect of the invention is based on the object of improving the operation and the maintenance of a WLL feeder system and, in particular, of improving the transmission of updated program and/or operating information to decentralized communications devices which are arranged in WLL feeder systems.

[0013] The major aspect of the method for transmitting program and/or operating information, which is stored centrally in a communications network, via at least one feeder device to a number of decentralized communications devices which can be connected to the feeder device comprises the program and/or operating information transmitted to the feeder device being inserted into broadcast transmission messages, which are transmitted via at least one broadcast transmission channel to the decentralized communications devices, and being transmitted to the decentralized communications devices. The program and/or operating information is matched in the communications network or in the feeder device to the transmission characteristics of the at least one broadcast transmission channel.

[0014] According to one alternative refinement, the program and/or operating information which is stored centrally in a communications network is transmitted to the at least one feeder device, where it is temporarily stored. The program information which is temporarily stored in the at least one feeder unit is then transmitted to the decentralized communications devices.

[0015] The major advantage of the method is that the time required for transmitting program and/or operating information, which is stored centrally in a communications network, to a number of decentralized communications devices, which are arranged in the communications network, is minimized and, in particular, the technical effort and financial cost involved in operation and/or maintenance of the communications network – for example for software updating within the communications network – is considerably reduced.

[0016] The temporarily stored program and/or operating information is advantageously transmitted via point-to-point connections or via at least one point-to-multipoint connection to the decentralized communications devices . The use of point-to-multipoint connections for transmitting the program and/or operating information to the decentralized communications devices further reduces the time involved when it is necessary to carry out a software update within the communications network.

[0017] According to one alternative refinement variant, the temporarily stored program and/or operating information is transmitted to the decentralized communications devices by broadcast transmission messages which are transmitted to the decentralized communications devices via at least one broadcast transmission channel, thus minimizing the time involved for a software update.

[0018] According to one advantageous development of the method, the program and/or operating information is transmitted to the feeder unit from a network administration unit which is arranged centrally in the communications network, in which case the temporarily stored program and/or operating information is transmitted to the decentralized communications devices in each case controlled by the network administration unit . As a result of this advantageous refinement, the network administration unit which is arranged centrally in the communications network always has an overview of the decentralized communications devices to which the updated program and/or operating information has already been transmitted, and of the decentralized communications devices in which the program and operating information based on an obsolete software version is still stored.

[0019] According to one development of the method, the feeder device comprises at least one feeder network access device and at least one feeder network device which is connected to them via at least one user channel and at least one signaling channel, in which case the program and/or operating information is temporarily stored in the feeder network access device or in the feeder network device, and is transmitted from there to the decentralized communications devices . The at least one feeder network device and the decentralized communications devices are advantageously in the form of wireless devices, in which the wireless, decentralized communications devices and the at least one wireless feeder network device can be connected to one another via a wireless transmission medium which has at least one user channel and at least one signaling or broadcast transmission channel . These advantageous developments of the method allow software updating within current wireless subscriber access networks and WLL feeder systems requiring a very short time, and which can thus be carried out economically.

BRIEF DESCRIPTION OF THE DRAWINGS

[0020] These and other objects and advantages of the present invention will become more apparent and more readily appreciated from the following description of the preferred embodiments, taken in conjunction with the accompanying drawings of which:

Fig. 1 shows a schematic illustration of the process of a software download in a WLL feeder system, controlled by a network administration unit, in which the updated program information to be transmitted is temporarily stored in the feeder network access device, and is then transmitted via the feeder network device to the decentralized communications devices,

Fig. 2 shows the process of a software download in a WLL feeder system as shown in Fig. 1, in which the program information to be transmitted is temporarily stored in the feeder network device, and is transmitted to the decentralized communications devices by broadcast transmission messages,

Fig. 3 shows the process of a software download in a WLL feeder system as shown in Fig. 1, in which the program information to be transmitted is transmitted to the decentralized communications devices by broadcast transmission messages, without being temporarily stored, and

Fig. 4 shows the process of a software download in a WLL feeder system as shown in Figure 1, in which the program information to be transmitted is temporarily stored in the feeder network device, and is then transmitted to the decentralized communications devices, controlled

by the network administration unit, in the course of point-to-point connections or at least one point-to-multipoint connection.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0021] Reference will now be made in detail to the preferred embodiments of the present invention, examples of which are illustrated in the accompanying drawings, wherein like reference numerals refer to like elements throughout.

[0022] Fig. 1 shows a block diagram of a wireless WLL feeder system ACCESS, in which a number of decentralized, wireless communications devices RNT1...n can be connected via a feeder device ZE to a higher-level, for example ISDN-oriented, communications network ISDN. The decentralized communications devices RNT1...n may, for example, be in the form of wireless network termination devices, to each of which one or more communications terminals which are not illustrated - for example analog telephones (POTS) or personal computers or ISDN terminals - can be connected. Alternatively, the decentralized communications devices RNT1...n may also be in the form of mobile communications terminals with an integrated network termination device – also referred to as a "mobile phone". The feeder device ZE comprises a central feeder network device RCS, which represents a base station and by which the wireless, decentralized communications devices RNT1...n can be connected via an air interface and via the wireless transmission medium "radio channel" FK. The feeder network device RCS, the air interface, the radio channel FK and the wireless, decentralized communications devices RNT1...n may, for example, be designed in accordance with the DECT, GSM or UMTS Standard, or in accordance with a further future mobile radio standard. Furthermore, the wireless devices RCS, FK, RNT1...n can be designed using a B-CDMA transmission method.

[0023] The feeder device ZE furthermore comprises a feeder network access device RDU, which is connected to the ISDN-oriented communications network ISDN via a V.5.1 or V.5.2 interface. The central feeder network device RCS can be connected to the feeder network access device RDU via one or more connecting lines – for example a copper line or optical waveguide- or via a direction radio link. In this exemplary embodiment, the connection between the feeder network access device RDU and the feeder network device RCS is in the form of a data link HDSL which has, for example, a data transmission rate of 2 Mbits/s – also referred to as a "2 Mbits/s link" – via which the information to be transmitted is transmitted in accordance

with the HDSL transmission method. The HDSL connection HDSL comprises a number of 64 kbits/s user channels and one 64 kbits/s signaling channel via which the signaling information which is to be transmitted to the decentralized communications devices RNT1...n is transmitted. The feeder network access device RDU is connected to a network administration unit TMN, which is arranged centrally in the WLL feeder system ACCESS, via a TMN or OAM interface, which has a data transmission rate of 64 kbits/s and, for example, is in the form of a QD2 interface, and a connecting line - also referred to as a "64 kbits/s QD2 link". The network administration unit TMN has a memory MEM arranged in it, in which the program information sw is stored, which represents the updated version of a control program. In addition, further updated operating information, such as updated tariff information can be stored in the network administration unit.

[0024] Each decentralized communications device RNT1...n has a memory MEM arranged in it, in each of which the program information in a control program swo is stored, which controls the functional and procedural processes for the respective decentralized communications device RNT1...n. For the exemplary embodiment, it is assumed that the program information swo which is stored in the memory MEM in each of the individual decentralized communications devices RNT1...n is "obsolete" and should in each case be replaced by the updated program information sw which is stored in the memory MEM of the network administration unit TMN. It should be noted that the updated program information sw or operating information makes it possible to provide additional services or options in the respective decentralized communications devices RNT1...n.

[0025] A buffer store ZM is provided, in the feeder network access device RDU, for temporary storage of the program information sw to be transmitted, in order to transmit the program information sw, which is stored in the network administration unit TMN, via the feeder unit ZE to the decentralized communications units RNT1...n. In the case of the software download represented by dashed arrows in Figure 1, the program information sw which is stored in the memory MEM of the network administration device TMN is transmitted via the QD2 interface QD2 to the feeder network access device RDU, and is temporarily stored in the buffer store ZM. Since, for technical reasons, the data transmission rate – 64 kbits/s – of the QD2 interface QD2 cannot be increased and is used in other ways for administration of the WLL feeder system, transmitting the program information sw once from the network administration

unit to the feeder network access device RDU makes effective use of the transmission resources provided by the QD2 interface.

[0026] For the subsequent software download of the temporarily stored program information sw' to the individual decentralized communications devices RNT1...n, a separate user channel connection, which has a data transmission rate of 64 kbits/s, is in each case set up, controlled by the network administration unit TMN, from the feeder network access device RDU and via the feeder network device RCS to the respective decentralized communications device RNT1...n. This data link is advantageously set up as a "silent call", that is to say without any alarm tone, to the respective decentralized communications devices RNT1...n. Since a separate user data channel is used instead of the signaling channel for transmitting the temporarily stored program information sw' on the HDSL connection HDSL which is arranged between the feeder network access device RDU and the feeder network device RCS, this avoids any interference with the signaling information transmitted in the signaling channel of the HDSL connection HDSL. In addition to temporary storage of the program information sw, this represents a further optimization step in comparison to the known methods for software updating.

[0027] The program information sw' arriving in the feeder network device RCS is then – instead of the OW channel – transmitted to the respective decentralized communications device RNT1...n via a 64 kbits/s user channel connection which is in each case set up via the air interface using the "silent call" connection. The program information sw' which is temporarily stored in the feeder network access device RDU can advantageously be transmitted in parallel via the feeder network device RCS to a number of decentralized communications devices RNT1...n at the same time via a number of silent call connections which are set up in parallel – and which are also referred to as multicast connections – and are stored in these decentralized communications devices RNT1...n. The number of "software downloads" which can be carried out at the same time in parallel in this way is in this case dependent on the transmission capacity of the HDSL connection HDSL, which is arranged between the feeder network access device RDU and the feeder network device RCS, and on the transmission capacity of the air interface, as well as the number of subscribers who are communicating via the WLL feeder system ACCESS.

[0028] In order to speed up the software download process, with the program information sw to be transmitted being segmented as provided in layer 7 of the OSI reference model, the

segment size of a data packet can be increased from the previous 256 bytes to, for example, 24 kbytes. Increasing the segment size of the data packets to be transmitted results in a reduction in the signaling information transmitted by the decentralized communications devices RNT1...n in the upstream direction while carrying out a software download and, in particular, in a reduction in the confirmation information transmitted to the network administration unit TMN.

[0029] One major advantage of the software download process illustrated in Figure 1 is that there is no need for any change to the procedures provided in current WLL feeder systems in order to speed up the transmission of the program information sw to be transmitted. The software download method illustrated in Figure 1 can thus be used even in already installed WLL feeder systems and in decentralized communications devices RNT1...n which have already been delivered. The respective connection setting-up process (which is controlled by the network administration unit TMN) from the feeder network access device RDU to the respective decentralized communications device RNT1...n and the transmission (which is controlled by the network administration unit TMN) of the program information sw provide the network administration unit TMN with an overview at all times of the decentralized communications devices RNT1...n in which the updated program information sw is already stored, and of the decentralized communications devices RNT1...n in which control programs based on "obsolete" program information swo are still active.

[0030] Fig. 2 shows a first refinement variant of the software download process illustrated in Figure 1. In contrast to Figure 1, the buffer store ZM is arranged in the feeder network device RCS in the WLL feeder system ACCESS illustrated in Figure 2. In the event of a software download – represented by dashed arrows in Figure 2 – the updated program information sw which is stored in the network administration unit TMN is transmitted via the QD2 interface QD2 to the feeder network access device RDU and from there via a 64 kbits/s user channel in the HDSL connection HDSL to the feeder network device RCS, and is stored in the buffer store ZM in the feeder network device RCS.

[0031] Since, in this refinement variant, the updated program information sw need be transmitted only once from the network administration unit TMN to the feeder network device RCS, it should be noted that the program information sw can also be transmitted via other transmission channels (which, for example, provide less transmission capacity) in the WLL feeder system ACCESS.

[0032] The broadcast transmission messages, which are transmitted via a broadcast transmission channel from the feeder network device RCS to all the decentralized communications devices RNT1...n – and which are also referred to as broadcast methods – are used for transmitting the program information sw', which is stored in the buffer store ZM in the feeder network device RCS, to the respective decentralized communications devices RNT1...n. By way of example, the slow broadcast channel SBCH can be used for transmitting the updated program information sw in the course of the broadcast method. In current WLL feeder systems – for example DEClink or TDMAlink from the Siemens Company – the slow broadcast channel SBCH is used for transmitting paging information and, for example, for transmitting a system time. Those transmission resources which are still free in the slow broadcast channel SBCH are, in the case of this refinement variant, used for transmitting program information sw to the individual decentralized communications devices RNT1...n by a broadcast method. Since no user channels in the air interface which is arranged between the decentralized communications devices RNT1...n and the feeder network device RCS are used for transmitting the program information sw from the feeder network device RCS to the decentralized communications devices RNT1...n, this avoids any additional resource loading on the RLL feeder system ACCESS, and reductions in performance caused in this way.

[0033] The program information sw is advantageously segmented, or subdivided into individual data packets and is transmitted a number of times successively via the slow broadcast channel SBCH, with the transmitted program information sw being received and stored packet-by-packet in the respective decentralized communications devices RNT1...n. Any data packets which may be received with errors can be received once again in one of the subsequent transmissions of the segmented program information and, provided it is received correctly, can be stored in the memory MEM of the respective decentralized communications device RNT1...n. The at least one control program which is represented by the stored program information sw may, for example, be initialized or started in the course of the broadcast method.

[0034] The confirmation information which is transmitted from the decentralized communications devices RNT1...n to the feeder network device RCS and/or to the network administration unit TMN, for example relating to the confirmation of successful reception of a data packet or relating to successful initialization of the updated program version, can lead to an increased number of signaling messages in the upstream direction. In order to avoid the decentralized communications devices RNT1...n being flooded with messages, the current

program information sw can be transmitted in the described manner in the course of the broadcast method via the slow broadcast channel SBCH to the decentralized communications devices RNT1...n; the subsequent activation or initialization of the respective current program version, which is stored in the memories MEM of the individual decentralized communications devices RNT1...n, can advantageously be carried out by the network administration unit TMN by silent call connections which are in each case set up specifically to the respective decentralized communications units RNT1...n.

[0035] Fig. 3 shows a refinement variant of the software download process illustrated in Fig. 2, based on a broadcast method. In contrast to Fig. 2, in the method illustrated in Fig. 3, the current program information sw is transmitted from the network administration unit TMN via the feeder network access device RDU to the feeder network device RCS without being temporarily stored. The program information sw which is transmitted to the feeder network device RCS is then inserted, in the course of a broadcast method, into the broadcast transmission messages which are transmitted via the slow broadcast channel SBCH, and is then transmitted to the respective decentralized communications devices RNT1...n – represented by dashed arrows. In this case, the data transmission speed and, in particular, the reading of the program information sw which is stored in the network administration unit TMN are matched to the data transmission rate of the slow broadcast channel SBCH. Such a software download without temporary storage in the feeder device ZE of the program information sw to be transmitted can be used, for example, if it is impossible to store the transmitted program information sw in the feeder network access device RDU or in the feeder network device RCS, for storage space reasons. The advantage of this refinement variant is the effective utilization of the transmission capacities provided by the "radio channel" transmission medium. In comparison to sequential downloading methods – for example by single or multicast connections – the use of a broadcast method results in a considerable reduction in the download time required for software updating within the entire WLL feeder system ACCESS. For example, 50 000 decentralized communications devices RNT1...n can be administered by one network administration unit TMN. The method illustrated in Figure 3 allows the software in the decentralized communications devices RNT1...n to be updated within a few hours, even with large numbers of subscribers. The time required to do this is in this case dependent, for example, on the segment size of the data packets, on the nature of the error correction method that is used, and on the quality of the "radio channel" transmission medium FK.

[0036] Fig. 4 shows a further refinement of the method, in which the program information sw to be transmitted from the network administration unit TMN to the respective decentralized communications devices RNT1...n is temporarily stored in a buffer store ZM which is arranged in the feeder network device RCS. During the software download process, which is represented by dashed arrows in Figure 4, the program information sw which is stored in the memory MEM in the network administration unit TMN is transmitted via the QD2 interface QD2 to the feeder network access device RDU, is transmitted from there via a 64 kbits/s user channel in the HDSL connection HDSL to the feeder network device RCS, and is temporarily stored in the buffer store ZM. One advantageous feature resulting from the transmission of the program information sw by using a 64 kbits/s user channel in the HDSL connection HDSL which is provided between the feeder network access device RDU and the feeder network device RCS is that this does not make use of any transmission resources in the signaling channel of the HDSL connection HDSL, thus avoiding any negative influence on the performance of the WLL feeder system ACCESS while carrying out a software download.

[0037] Since, in this refinement variant, the updated program information sw need be transmitted only once from the network administration unit TMN to the feeder network device RCS, it should be noted that the program information sw can also be transmitted via other transmission channels in the WLL feeder system ACCESS, for example transmission channels which provide less transmission capacity.

[0038] In the refinement variant illustrated in Fig. 4, the program information sw which is temporarily stored in the buffer store ZM in the feeder network device RCS is in each case transmitted to the individual decentralized communications devices RNT1...n in the course of a point-to-point connection – single-cast connection – between the network administration unit TMN and the respective decentralized communications device RNT1...n. The process of setting up the connection is controlled by the network administration unit TMN. The temporarily stored program information sw can advantageously be transmitted at the same time via a number of parallel point-to-point connections - multicast connections – to a number of decentralized communications devices RNT1...n, thus allowing a further reduction in the time required for software updating.

[0039] The use of the network administration unit TMN to control the transmission of the program information sw', which is temporarily stored in the feeder network device RCS, to the

individual decentralized communications units RNT1...n can be carried out using two transmission variants, which will be described in the following text.

[0040] According to a first transmission variant, a new service type is provided for a software update or for a software download, with a corresponding service type information "software download" being defined for current WLL feeder systems ACCESS – for example the CDMAlink from the Siemens Company. In order to initiate the specific transmission of the program information sw which is temporarily stored in the buffer store ZM in the feeder network device RCS to a specific decentralized communications device RNT1...n, the corresponding service type information "software download" is transmitted by the network administration unit TMN to the feeder network access device RDU. The service type information "software download" arriving in the feeder network access device RDU is dealt with in the same way as an incoming call, with the service type information "software download", which is transmitted by the network administration unit TMN, being identified and being passed on to the feeder network device RCS. When the feeder network device RCS receives "software download" service type information, corresponding paging information, which indicates a "software download", is transmitted to the relevant decentralized communication device RNT1...n, for example via a broadcast transmission channel or signaling channel. The transmitted paging information represents, for example, an instruction to set up a 64 kbits/s data channel connection – also referred to as a B-channel – from the respective decentralized communications device RNT1...n to the network administration unit TMN. Alternatively, instead of a broadcast transmission channel or signaling channel, an already existing OW channel connection can also be used for transmitting the paging information from the feeder network device RCS to the relevant decentralized communications device RNT1...n. On receiving the paging information which indicates a "software download", the decentralized communications device RNT1...n checks whether the transmission resources required for the software download are available or, for example, are being used by a user channel connection which is currently taking place via the air interface.

[0041] If the transmission resources required for the software download are currently not available, the relevant decentralized communications device RNT1...n transmits appropriate information, or a negative confirmation, to the network administration unit TMN. In the event of a negative confirmation, the software downloading process which is being initiated is interrupted, and is started again at some later time. If the resource check by the decentralized

communications device RNT1...n finds that the transmission resources required for a software download are available at that time, information indicating a corresponding positive confirmation is transmitted to the network administration unit TMN, and a 64 kbits/s user channel connection is then set up, in the form of a "silent call", between the relevant decentralized communications device RNT1...n and the network administration unit TMN. The feeder network device RCS is in this case granted access to the user channel connection which has been set up, in order to insert the temporarily stored program information sw'.

[0042] According to a second transmission variant, there is no need to define a new service type in order to carry out a software download. The process of setting up the connection, controlled by the network administration unit TMN, between the decentralized communications device RNT1...n and the network administration unit TMN for transmitting the updated program information sw' which is temporarily stored in the feeder network device RCS is dealt with like an outgoing call by the WLL feeder system ACCESS in the second transmission variant. In order to initiate the transmission of the program information sw' which is temporarily stored in the feeder network device RCS to the respective decentralized communications device RNT1...n, the network administration unit TMN transmits information which indicates a software download, via the feeder network access device RDU and via the feeder network device RCS, to the relevant decentralized communications device RNT1...n. This is done, for example, by setting up an OW channel connection to the respective decentralized communications device RNT1...n, if such a channel has not already been set up as a result of the transmission of additional signaling information.

[0043] After receiving the information which indicates a software download, the relevant decentralized communications device RNT1...n checks whether the transmission resources which are required for a software download are currently available or, for example, are being used by a user channel connection which is currently taking place via the air interface. In the situation where the required transmission resources are currently not available, the decentralized communications device RNT1...n transmits an appropriate negative acknowledgment via the feeder device ZE to the network administration unit TMN. When the network administration unit TMN receives a negative confirmation, the software downloading process which has been initiated is interrupted by the network administration unit TMN, and is started again at some later time. In the situation where the transmission capacities required for a software download are currently available, the relevant decentralized communications device

RNT1...n requests, in the course of a regular connection request – "Call Setup" – a 64 kbits/s user channel connection, or a B-channel connection, via the air interface and via the feeder device to the network administration unit TMN, in the form of a "silent call". The requested user channel connection is set up in such a way that the feeder network device RCS is granted access to the user channel connection which has been set up, in order to insert the temporarily stored program information sw.

[0044] After setting up the connection, which is required for the software download, between the relevant decentralized communications device RNT1...n and the network administration unit TMN using the first or second transmission variant, the program information sw' which is temporarily stored in the feeder network device RCS is transmitted in segments, that is to say in the form of data packets, in the B-channel connection, via the air interface to the respective decentralized communications device RNT1...n, depending on the respectively chosen segment size. The relevant decentralized communications device RNT1...n uses an error identification routine – for example calculation of the checksum – to check the received data packets. If it is found that a data packet has been received without any errors, a corresponding confirmation message is transmitted to the network administration unit TMN, and the received data packet is stored in the memory MEM. The memory MEM which is arranged in the individual decentralized communications devices RNT1...n may, for example, be in the form of EPROM.

[0045] The confirmation messages which are produced for data packets which have been received without any errors are advantageously transmitted to the feeder network device RCS via the 64 kbits/s B-channel connection which was set up. Once all the program information sw' has been transmitted without any errors to the respective decentralized communications device RNT1...n, information which indicates that the software downloading process has been successful and has been free of errors is transmitted from the feeder network device RCS to the network administration unit TMN, and the B-channel connection set up for this purpose is cleared.

[0046] Once a software updating process has been carried out successfully for a decentralized communications device RNT1...n, that is to say once the transmitted program information sw has been stored in the memory MEM in the respective decentralized communications device RNT1...n and once the B-channel connection which was set up for this purpose has been cleared, the control program which is represented by the stored program information sw is started. This is done, for example, by restarting or resetting the respective

decentralized communications device RNT1...n, once the B-channel connection has been cleared. Once a restart has been carried out, an appropriate message is advantageously transmitted to the network administration unit TMN. When the network administration unit TMN receives information which indicates that the respective decentralized communications device RNT1...n has been successfully restarted, the software downloading process which was carried out for the respective decentralized communications device RNT1...n is regarded as being complete.

[0047] In order to minimize the occurrence of transmission errors during the transmission of the data packets from the feeder network device RCS via the air interface to the respective decentralized communications device RNT1...n, a forward error correction "FEC" method can advantageously be implemented.

[0048] A further advantage of the refinement variant of the software downloading process illustrated in Figure 4 comprises the capability to transmit information which represents, for example, the progress of the software downloading process via the bidirectional connection, which was set up for the software downloading process, between the respective decentralized communications device RNT1...n and the network administration unit TMN, from the respective decentralized communications device RNT1...n to the network administration device TMN.

[0049] In order to shorten the time interval which a decentralized communications device RNT1...n in each case requires for a software downloading process, the segment size of the data packets which are used for transmitting the updated program information sw can advantageously be set to the maximum possible value, for example 24 kbytes.

[0050] In order to further shorten the respective time interval required for a software download, the current program information sw is stored in compressed form in the network administration unit TMN. An appropriate decompression method must be implemented in the respective decentralized communications devices RNT1...n in order to decompress the compressed program information sw which is transmitted to the respective decentralized communications devices RNT1...n.

[0051] It should be mentioned that the method can be used for transmitting program and/or operating information, which is stored centrally in a communications network, in any type of wire-based, wireless, wire-free or cordless communications networks to decentralized communications devices connected to them. Thus, for example, settop boxes (RNT1...n) which

are arranged in a wire-based multimedia communications network can be regularly updated with the latest software version with little time required, in the course of OAM functionalities.

[0052] The invention has been described in detail with particular reference to preferred embodiments thereof and examples, but it will be understood that variations and modifications can be effected within the spirit and scope of the invention.

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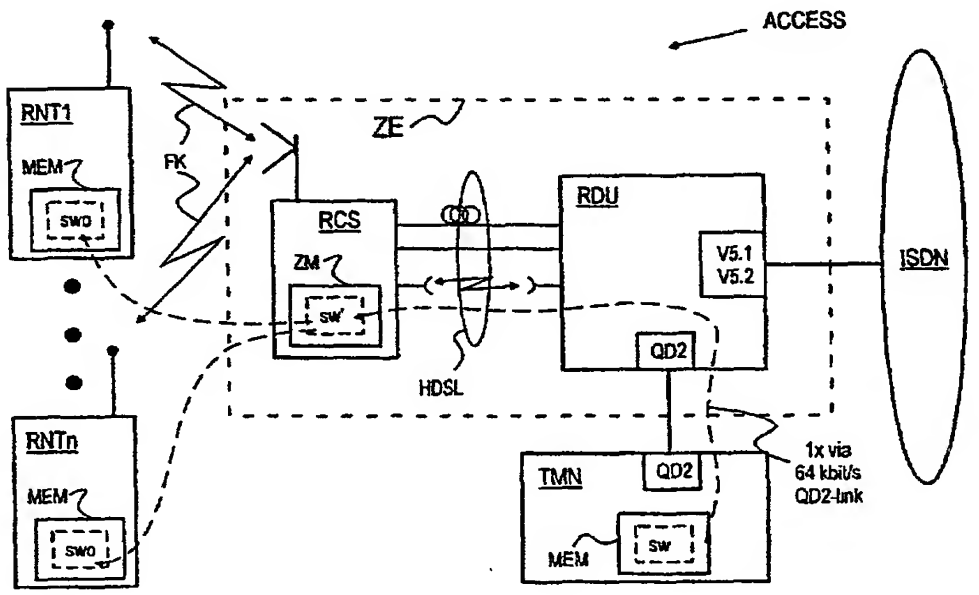
[Fortsetzung auf der nächsten Seite]

(54) Title: METHOD OF TRANSMITTING PROGRAM AND/OR OPERATIONAL INFORMATION THAT IS CENTRALLY STORED IN A COMMUNICATION NETWORK TO SEVERAL DECENTRALIZED COMMUNICATION DEVICES

(54) Bezeichnung: VERFAHREN ZUM ÜBERMITTELN VON ZENTRAL IN EINEM KOMMUNIKATIONSNETZ GERSPEICHERTEN PROGRAMM- UND/ODER BETRIEBSINFORMATIONEN AN MEHRERE DEZENTRALE KOMMUNIKATIONSEINRICHTUNGEN



(57) **Abstract:** The invention relates to a method of transmitting program and/or operational information (sw) that is centrally stored and updated in a communication network (ACCESS). Said information is temporarily stored in an external device (ZE) and is then transmitted to several decentralized communication devices (RNT1 n). Alternatively, the program information (sw) is transmitted to the decentralized communication devices (RNT1 n) by means of multiadress messages without temporarily storing it. The inventive method substantially reduces the amount of time used to carry out a software update within the communication network (ACCESS).

[Fortsetzung auf der nächsten Seite]

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Description

Method for transmitting program and/or operating information, which is stored centrally in a communications network, to a number of decentralized communications devices

In wireless communications networks, which are based on radio channels, in particular in point-to-multipoint radio feeder networks - which are also referred to as "radio in the local loop" or "RLL", or "Wireless Local Loop" or "WLL" - a number of decentralized network termination units and/or decentralized communications devices which are in the form of network termination units are each connected via one or more radio channels to a base station - which is also referred to as a "Radio Base Station" or "RBS", or as a "Radio Carrier Station" or "RCS". By way of example, the document "DECTlink Radio Access: Where Performance Counts", 1996, Siemens Aktiengesellschaft and the document "CDMAlink A Winner in any Terrain", 1997, Siemens Aktiengesellschaft describe WLL feeder systems which are designed for wireless voice and data communication.

The feeder systems described in said documents each represent a wireless subscriber connection which can be produced in a short time and without major effort, instead of laying wire connecting lines. The decentralized, wireless communications units RMT allocated to the individual subscribers are each connected via the "radio channel" transmission medium to a feeder device, which is connected to a higher-level communications network PSTN, for example to the ISDN-oriented landline network ISDN. The wireless radio channels are designed in accordance with the DECT Standard or in accordance with the CDMA transmission method. The feeder device comprises at least one central feeder network device RBS or RCS, which in each case terminates the air interface of the feeder network and represents a base station, and at least one feeder network access device RDU, which provides the connection to the higher-level communications network. The central feeder network device and the feeder network access device are connected to one another via copper lines, optical waveguides or directional radio links. The information to be transmitted is transmitted, for

example, based on the HDSL transmission technology - High-bit Rate Digital Subscriber Line - at a data transmission rate of for example 2 Mbits/s - also referred to as a "2 Mbits/s Link" -, with the HDSL connection comprising a number of 64 kbits user channels and a 64 kbits signaling channel which is used jointly by all the decentralized communications devices. The signaling information for all the decentralized network termination units and decentralized communications devices arranged in the radio area of the feeder device is transmitted from the feeder network access device, to the central feeder network device via the signaling channel.

The feeder network access device is connected to the higher-level ISDN communications network via a standardized interface in accordance with the V5.1 or V5.2 Standard. The feeder network access device is connected via a network administration interface to a central network administration device - referred to as an "ONMS AccessIntegrator" in the cited documents. The network administration interface may, for example, be in the form of a Q interface or a QD2 interface. The central network administration unit provides all the functions for operating the feeder device and for operating the feeder network, as well as for its administration and maintenance - also referred to as OAM functions (Operation, Administration, Maintenance). The OAM information required for controlling and carrying out the OAM functions is, for example, transmitted using a QD2 protocol via the QD2 interface, or using an SNMP protocol (Simple Network Management Protocol) via a TMN interface (Telecommunications Management Network) or OAM interface to the feeder device.

By way of example, in the case of maintenance processes which need to be carried out in current WLL feeder systems, updated operating parameters and operating information, or updated versions of control or operating programs, must be transmitted from the centrally arranged network administration device via the feeder device to the decentralized communications devices which are arranged in the radio area of the feeder device. The methods used in current WLL feeder systems - for example CDMALink or DECTLink

from the Siemens Company - for transmitting updated program and/or operating information - also referred to in the following text as software download or software updating - are based on purely sequential transmission of the updated information from the central network administration device to the individual decentralized communications devices via the feeder device. In this case, point-to-point connection is in each case set up from the central network administration device to the respective decentralized communications device to be updated, and the current program information is then transmitted via the QD2 interface.

Said WLL feeder systems have the disadvantage that the transmission capacity which can be used for a software download is restricted by a number of capacity constraints - also referred to as bottlenecks:

The network administration device provides a data transmission rate of 64 kbits/s via the QD2 interface for transmitting OAM information and updated program and operating information to the feeder network access device. The data transmission rate of the QD2 interface cannot be increased.

In the course of a software download, only the transmission capacity of the 64 kbits/s signaling channel in the HDSL connection is available for transmitting the updated information from the feeder network access device to the feeder network device. Since all the signaling information which occurs at any given time for the decentralized communications devices which are arranged in the radio area of the feeder device - also referred to as "IV5 signaling information" must be transmitted via this signaling channel - also referred to as the "IV5 C channel" in the following text - only a portion of the transmission capacity of the IV5 C channel - approximately 5 kbits/s - can be used for a software download. This represents a very major capacity constraint for transmitting updated program information from the network administration unit to the decentralized communications devices.

The program information which is transmitted via the IV5 C channel in the HDSL connection to the central feeder network device is then transmitted on the air interface via a special OW signaling channel - referred to as the "order wire channel" or "OW channel" in DECT link and CDMA link systems - together with the respective up-to-date signaling information to the decentralized communications devices. The OW signaling channel uses a data transmission rate of 16 kbits/s.

A further constraint on the transmission capacity for the purposes of a software download is represented by a confirmation mechanism, which is implemented in layer 7 of the OSI reference model, for point-to-point connections which pass via the QD2 interface, as a result of which the OAM information or program information which is transmitted via the QD2 interface is segmented. In order to minimize the signaling information originating from the subscribers, the segment size is defined to be 256 bytes, which is also applicable to the transmission of program information via the QD2 interface.

With regard to said capacity constraints, the data transmission rate which can be used for a software download or for software updating for a point-to-point connection between the network administration unit and the respective decentralized communications device is restricted to approximately 5 kbits/s. This means that, for software updating, in which, for example, program information amounting to 440 bytes of data must be transmitted to each decentralized communications device which is arranged in the radio area of the feeder device, only 3 to 6 decentralized communications devices can be updated within one hour. Thus, assuming a working day of 8 hours, approximately 80 days are required for software updating of a WLL feeder system of the full extent, with 1920 connected subscribers. It is thus impossible with the previously known methods to supply all the decentralized communications devices in a WLL feeder system of the full extent with, for example, an updated software version in an acceptable time. In addition, in the case of a software download, the signaling channels of the WLL feeder system are permanently

overloaded, which has a negative influence on operating stability and the performance of the WLL feeder system.

The invention is based on the object of improving the operation and the maintenance of a WLL feeder system and, in particular, of improving the transmission of updated program and/or operating information to decentralized communications devices which are arranged in WLL feeder systems. Against the background of the method as claimed by the features in the precharacterizing clause of patent claims 1 and 2, and against the background of a communications arrangement as claimed in the features of the precharacterizing clause of patent claims 23 and 24, the object is achieved by the respective characterizing features.

The major aspect of the method according to the invention for transmitting program and/or operating information, which is stored centrally in a communications network, via at least one feeder device to a number of decentralized communications devices which can be connected to the feeder device comprises the program and/or operating information transmitted to the feeder device being inserted into broadcast transmission messages, which are transmitted via at least one broadcast transmission channel to the decentralized communications devices, and being transmitted to the decentralized communications devices. The program and/or operating information is matched in the communications network or in the feeder device to the transmission characteristics of the at least one broadcast transmission channel.

According to one alternative refinement variant of the method according to the invention, the program and/or operating information which is stored centrally in a communications network is transmitted to the at least one feeder device, where it is temporarily stored. The program information which is temporarily stored in the at least one feeder unit is then transmitted to the decentralized communications devices.

The major advantage of the method according to the invention is that the time required for transmitting program and/or operating

information, which is stored centrally in a communications network, to a number of decentralized communications devices, which are arranged in the communications network, is minimized and, in particular, the technical effort and financial cost involved in operation and/or maintenance of the communications network - for example for software updating within the communications network - is considerably reduced.

The temporarily stored program and/or operating information is advantageously transmitted via point-to-point connections or via at least one point-to-multipoint connection to the decentralized communications devices - claim 4. The use of point-to-multipoint connections for transmitting the program and/or operating information to the decentralized communications devices further reduces the time involved when it is necessary to carry out a software update within the communications network.

According to one alternative refinement variant, the temporarily stored program and/or operating information is transmitted to the decentralized communications devices by means of broadcast transmission messages which are transmitted to the decentralized communications devices via at least one broadcast transmission channel - claim 6 - thus minimizing the time involved for a software update.

According to one advantageous development of the method according to the invention, the program and/or operating information is transmitted to the feeder unit from a network administration unit which is arranged centrally in the communications network - claim 7 - in which case the temporarily stored program and/or operating information is transmitted to the decentralized communications devices in each case controlled by the network administration unit - claim 8. As a result of this advantageous refinement, the network administration unit which is arranged centrally in the communications network always has an overview of the decentralized communications devices to which the updated program and/or operating information has already been transmitted, and of the decentralized communications devices in which the

program and operating information based on an obsolete software version is still stored.

According to one development of the method according to the invention, the feeder device comprises at least one feeder network access device and at least one feeder network device which is connected to them via at least one user channel and at least one signaling channel - claim 12, in which case the program and/or operating information is temporarily stored in the feeder network access device or in the feeder network device, and is transmitted from there to the decentralized communications devices - claim 13. The at least one feeder network device and the decentralized communications devices are advantageously in the form of wireless devices, in which the wireless, decentralized communications devices and the at least one wireless feeder network device can be connected to one another via a wireless transmission medium which has at least one user channel and at least one signaling or broadcast transmission channel - claim 16. These advantageous developments of the method according to the invention allow software updating within current wireless subscriber access networks and WLL feeder systems requiring a very short time, and which can thus be carried out economically.

Further advantageous refinements of the method according to the invention, as well as a communications arrangement, can be found in the further claims.

The method according to the invention will be explained in more detail in the following text with reference to four block diagrams, in which:

Figure 1 shows a schematic illustration of the process of a software download in a WLL feeder system, controlled by a network administration unit, in which the updated program information to be transmitted is temporarily stored in the feeder network access device, and is then transmitted via the feeder network device to the decentralized communications devices,

Figure 2 shows the process of a software download in a WLL feeder system as shown in Figure 1, in which the program information to be transmitted is temporarily stored in the feeder network device, and is transmitted to the decentralized communications devices by means of broadcast transmission messages,

Figure 3 shows the process of a software download in a WLL feeder system as shown in Figure 1, in which the program information to be transmitted is transmitted to the decentralized communications devices by means of broadcast transmission messages, without being temporarily stored, and

Figure 4 shows the process of a software download in a WLL feeder system as shown in Figure 1, in which the program information to be transmitted is temporarily stored in the feeder network device, and is then transmitted to the decentralized communications devices, controlled by the network administration unit, in the course of point-to-point connections or at least one point-to-multipoint connection.

Figure 1 shows a block diagram of a wireless WLL feeder system ACCESS, in which a number of decentralized, wireless communications devices RNT1...n can be connected via a feeder device ZE to a higher-level, for example ISDN-oriented, communications network ISDN. The decentralized communications devices RNT1...n may, for example, be in the form of wireless network termination devices, to each of which one or more communications terminals which are not illustrated - for example analog telephones (POTS) or personal computers or ISDN terminals - can be connected. Alternatively, the decentralized communications devices RNT1...n may also be in the form of mobile communications terminals with an integrated network termination device - also referred to as a "mobile phone". The feeder device ZE comprises a central feeder network device RCS, which represents

a base station and by means of which the wireless, decentralized communications devices RNT1...n can be connected via an air interface and via the wireless transmission medium "radio channel" FK. The feeder network device RCS, the air interface, the radio channel FK and the wireless, decentralized communications devices RNT1...n may, for example, be designed in accordance with the DECT, GSM or UMTS Standard, or in accordance with a further future mobile radio standard. Furthermore, said wireless devices RCS, FK, RNT1...n can be designed using a B-CDMA transmission method.

The feeder device ZE furthermore comprises a feeder network access device RDU, which is connected to the ISDN-oriented communications network ISDN via a V.5.1 or V.5.2 interface. The central feeder network device RCS can be connected to the feeder network access device RDU via one or more connecting lines - for example a copper line or optical waveguide- or via a direction radio link. In this exemplary embodiment, the connection between the feeder network access device RDU and the feeder network device RCS is in the form of a data link HDSL which has, for example, a data transmission rate of 2 Mbits/s - also referred to as a "2 Mbits/s link" - via which the information to be transmitted is transmitted in accordance with the HDSL transmission method. The HDSL connection HDSL comprises a number of 64 kbits/s user channels and one 64 kbits/s signaling channel via which the signaling information which is to be transmitted to the decentralized communications devices RNT1...n is transmitted. The feeder network access device RDU is connected to a network administration unit TMN, which is arranged centrally in the WLL feeder system ACCESS, via a TMN or OAM interface, which has a data transmission rate of 64 kbits/s and, for example, is in the form of a QD2 interface, and a connecting line - also referred to as a "64 kbits/s QD2 link". The network administration unit TMN has a memory MEM arranged in it, in which the program information sw is stored, which represents the updated version of a control program. In addition, further updated operating information, such as updated tariff information can be stored in the network administration unit.

Each decentralized communications device RNT1...n has a memory MEM

arranged in it, in each of which the program information in a control program swo is stored, which controls the functional and procedural processes for the respective decentralized communications device RNT1...n. For the exemplary embodiment, it is assumed that the program information swo which is stored in the memory MEM in each of the individual decentralized communications devices RNT1...n is "obsolete" and should in each case be replaced by the updated program information sw which is stored in the memory MEM of the network administration unit TMN. It should be noted that the updated program information sw or operating information makes it possible to provide additional services or options in the respective decentralized communications devices RNT1...n.

According to the invention, a buffer store ZM is provided, in the feeder network access device RDU, for temporary storage of the program information sw to be transmitted, in order to transmit the program information sw, which is stored in the network administration unit TMN, via the feeder unit ZE to the decentralized communications units RNT1...n. In the case of the software download represented by dashed arrows in Figure 1, the program information sw which is stored in the memory MEM of the network administration device TMN is transmitted via the QD2 interface QD2 to the feeder network access device RDU, and is temporarily stored in the buffer store ZM. Since, for technical reasons, the data transmission rate - 64 kbits/s - of the QD2 interface QD2 cannot be increased and is used in other ways for administration of the WLL feeder system, transmitting the program information sw once from the network administration unit to the feeder network access device RDU makes effective use of the transmission resources provided by the QD2 interface.

For the subsequent software download of the temporarily stored program information sw' to the individual decentralized communications devices RNT1...n, a separate user channel connection, which has a data transmission rate of 64 kbits/s, is in each case set up, controlled by the network administration unit TMN, from the feeder network access device RDU and via the feeder

network device RCS to the respective decentralized communications device RNT1...n. This data link is advantageously set up as a "silent call", that is to say without any alarm tone, to the respective decentralized communications devices RNT1...n. Since a separate user data channel is used instead of the signaling channel for transmitting the temporarily stored program information sw' on the HDSL connection HDSL which is arranged between the feeder network access device RDU and the feeder network device RCS, this avoids any interference with the signaling information transmitted in the signaling channel of the HDSL connection HDSL. In addition to temporary storage of the program information sw, this represents a further optimization step in comparison to the known methods for software updating.

The program information sw' arriving in the feeder network device RCS is then - instead of the OW channel - transmitted to the respective decentralized communications device RNT1...n via a 64 kbits/s user channel connection which is in each case set up via the air interface using the "silent call" connection. The program information sw' which is temporarily stored in the feeder network access device RDU can advantageously be transmitted in parallel via the feeder network device RCS to a number of decentralized communications devices RNT1...n at the same time via a number of silent call connections which are set up in parallel - and which are also referred to as multicast connections - and are stored in these decentralized communications devices RNT1...n. The number of "software downloads" which can be carried out at the same time in parallel in this way is in this case dependent on the transmission capacity of the HDSL connection HDSL, which is arranged between the feeder network access device RDU and the feeder network device RCS, and on the transmission capacity of the air interface, as well as the number of subscribers who are communicating via the WLL feeder system ACCESS.

In order to speed up the software download process, with the program information sw to be transmitted being segmented as provided in layer 7 of the OSI reference model, the segment size of a data packet can be increased from the previous 256 bytes to,

for example, 24 kbytes. Increasing the segment size of the data packets to be transmitted results in a reduction in the signaling information transmitted by the decentralized communications devices RNT1...n in the upstream direction while carrying out a software download and, in particular, in a reduction in the confirmation information transmitted to the network administration unit TMN.

One major advantage of the software download process illustrated in Figure 1 is that there is no need for any change to the procedures provided in current WLL feeder systems in order to speed up the transmission of the program information sw to be transmitted. The software download method illustrated in Figure 1 can thus be used even in already installed WLL feeder systems and in decentralized communications devices RNT1...n which have already been delivered. The respective connection setting-up process (which is controlled by the network administration unit TMN) from the feeder network access device RDU to the respective decentralized communications device RNT1...n and the transmission (which is controlled by the network administration unit TMN) of the program information sw provide the network administration unit TMN with an overview at all times of the decentralized communications devices RNT1...n in which the updated program information sw is already stored, and of the decentralized communications devices RNT1...n in which control programs based on "obsolete" program information swo are still active.

Figure 2 shows a first refinement variant of the software download process illustrated in Figure 1. In contrast to Figure 1, the buffer store ZM is arranged in the feeder network device RCS in the WLL feeder system ACCESS illustrated in Figure 2. In the event of a software download - represented by dashed arrows in Figure 2 - the updated program information sw which is stored in the network administration unit TMN is transmitted via the QD2 interface QD2 to the feeder network access device RDU and from there via a 64 kbits/s user channel in the HDSL connection HDSL to the feeder network device RCS, and is stored in the buffer store ZM in the feeder network device RCS.

Since, in this refinement variant, the updated program information sw need be transmitted only once from the network administration unit TMN to the feeder network device RCS, it should be noted that the program information sw can also be transmitted via other transmission channels (which, for example, provide less transmission capacity) in the WLL feeder system ACCESS.

The broadcast transmission messages, which are transmitted via a broadcast transmission channel from the feeder network device RCS to all the decentralized communications devices RNT1...n - and which are also referred to as broadcast methods - are used for transmitting the program information sw', which is stored in the buffer store ZM in the feeder network device RCS, to the respective decentralized communications devices RNT1...n. By way of example, the slow broadcast channel SBCH can be used for transmitting the updated program information sw in the course of the broadcast method. In current WLL feeder systems - for example DEClink or TDMAlink from the Siemens Company - the slow broadcast channel SBCH is used for transmitting paging information and, for example, for transmitting a system time. Those transmission resources which are still free in the slow broadcast channel SBCH are, in the case of this refinement variant, used for transmitting program information sw to the individual decentralized communications devices RNT1...n by means of a broadcast method. Since no user channels in the air interface which is arranged between the decentralized communications devices RNT1...n and the feeder network device RCS are used for transmitting the program information sw from the feeder network device RCS to the decentralized communications devices RNT1...n, this avoids any additional resource loading on the RLL feeder system ACCESS, and reductions in performance caused in this way.

The program information sw is advantageously segmented, or subdivided into individual data packets and is transmitted a number of times successively via the slow broadcast channel SBCH, with the transmitted program information sw being received and stored packet-by-packet in the respective decentralized

communications devices RNT1...n. Any data packets which may be received with errors can be received once again in one of the subsequent transmissions of the segmented program information and, provided it is received correctly, can be stored in the memory MEM of the respective decentralized communications device RNT1...n. The at least one control program which is represented by the stored program information sw may, for example, be initialized or started in the course of the broadcast method.

The confirmation information which is transmitted from the decentralized communications devices RNT1...n to the feeder network device RCS and/or to the network administration unit TMN, for example relating to the confirmation of successful reception of a data packet or relating to successful initialization of the updated program version, can lead to an increased number of signaling messages in the upstream direction. In order to avoid the decentralized communications devices RNT1...n being flooded with messages, the current program information sw can be transmitted in the described manner in the course of the broadcast method via the slow broadcast channel SBCH to the decentralized communications devices RNT1...n; the subsequent activation or initialization of the respective current program version, which is stored in the memories MEM of the individual decentralized communications devices RNT1...n, can advantageously be carried out by the network administration unit TMN by means of silent call connections which are in each case set up specifically to the respective decentralized communications units RNT1...n.

Figure 3 shows a refinement variant of the software download process illustrated in Figure 2, based on a broadcast method. In contrast to Figure 2, in the method illustrated in Figure 3, the current program information sw is transmitted from the network administration unit TMN via the feeder network access device RDU to the feeder network device RCS without being temporarily stored. The program information sw which is transmitted to the feeder network device RCS is then inserted, in the course of a broadcast method, into the broadcast transmission messages which are transmitted via the slow broadcast channel SBCH, and is then

transmitted to the respective decentralized communications devices RNT1...n - represented by dashed arrows. In this case, the data transmission speed and, in particular, the reading of the program information sw which is stored in the network administration unit TMN are matched to the data transmission rate of the slow broadcast channel SBCH. Such a software download without temporary storage in the feeder device ZE of the program information sw to be transmitted can be used, for example, if it is impossible to store the transmitted program information sw in the feeder network access device RDU or in the feeder network device RCS, for storage space reasons. The advantage of this refinement variant is the effective utilization of the transmission capacities provided by the "radio channel" transmission medium. In comparison to sequential downloading methods - for example by means of single or multicast connections - the use of a broadcast method results in a considerable reduction in the download time required for software updating within the entire WLL feeder system ACCESS. For example, 50 000 decentralized communications devices RNT1...n can be administered by one network administration unit TMN. The method illustrated in Figure 3 allows the software in the decentralized communications devices RNT1...n to be updated within a few hours, even with large numbers of subscribers. The time required to do this is in this case dependent, for example, on the segment size of the data packets, on the nature of the error correction method that is used, and on the quality of the "radio channel" transmission medium FK.

Figure 4 shows a further refinement variant of the method according to the invention, in which the program information sw to be transmitted from the network administration unit TMN to the respective decentralized communications devices RNT1...n is temporarily stored in a buffer store ZM which is arranged in the feeder network device RCS. During the software download process, which is represented by dashed arrows in Figure 4, the program information sw which is stored in the memory SEM in the network administration unit TMN is transmitted via the QD2 interface QD2 to the feeder network access device RDU, is transmitted from there via a 64 kbits/s user channel in the HDSL connection HDSL to the

feeder network device RCS, and is temporarily stored in the buffer store ZM. One advantageous feature resulting from the transmission of the program information sw by using a 64 kbits/s user channel in the HDSL connection HDSL which is provided between the feeder network access device RDU and the feeder network device RCS is that this does not make use of any transmission resources in the signaling channel of the HDSL connection HDSL, thus avoiding any negative influence on the performance of the WLL feeder system ACCESS while carrying out a software download.

Since, in this refinement variant, the updated program information sw need be transmitted only once from the network administration unit TMN to the feeder network device RCS, it should be noted that the program information sw can also be transmitted via other transmission channels in the WLL feeder system ACCESS, for example transmission channels which provide less transmission capacity.

In the refinement variant illustrated in Figure 4, the program information sw which is temporarily stored in the buffer store ZM in the feeder network device RCS is in each case transmitted to the individual decentralized communications devices RNT1...n in the course of a point-to-point connection - single-cast connection - between the network administration unit TMN and the respective decentralized communications device RNT1...n. The process of setting up the connection is controlled by the network administration unit TMN. The temporarily stored program information sw can advantageously be transmitted at the same time via a number of parallel point-to-point connections - multicast connections - to a number of decentralized communications devices RNT1...n, thus allowing a further reduction in the time required for software updating.

The use of the network administration unit TMN to control the transmission of the program information sw', which is temporarily stored in the feeder network device RCS, to the individual decentralized communications units RNT1...n can be carried out using two transmission variants, which will be described in the following text.

According to a first transmission variant, a new service type is provided for a software update or for a software download, with a corresponding service type information "software download" being defined for current WLL feeder systems ACCESS - for example the CDMAlink from the Siemens Company. In order to initiate the specific transmission of the program information sw which is temporarily stored in the buffer store ZM in the feeder network device RCS to a specific decentralized communications device RNT1...n, the corresponding service type information "software download" is transmitted by the network administration unit TMN to the feeder network access device RDU. The service type information "software download" arriving in the feeder network access device RDU is dealt with in the same way as an incoming call, with the service type information "software download", which is transmitted by the network administration unit TMN, being identified and being passed on to the feeder network device RCS. When the feeder network device RCS receives "software download" service type information, corresponding paging information, which indicates a "software download", is transmitted to the relevant decentralized communication device RNT1...n, for example via a broadcast transmission channel or signaling channel. The transmitted paging information represents, for example, an instruction to set up a 64 kbits/s data channel connection - also referred to as a B-channel - from the respective decentralized communications device RNT1...n to the network administration unit TMN. Alternatively, instead of a broadcast transmission channel or signaling channel, an already existing OW channel connection can also be used for transmitting the paging information from the feeder network device RCS to the relevant decentralized communications device RNT1...n. On receiving the paging information which indicates a "software download", the decentralized communications device RNT1...n checks whether the transmission resources required for the software download are available or, for example, are being used by a user channel connection which is currently taking place via the air interface.

If the transmission resources required for the software download

are currently not available, the relevant decentralized communications device RNT1...n transmits appropriate information, or a negative confirmation, to the network administration unit TMN. In the event of a negative confirmation, the software downloading process which is being initiated is interrupted, and is started again at some later time. If the resource check by the decentralized communications device RNT1...n finds that the transmission resources required for a software download are available at that time, information indicating a corresponding positive confirmation is transmitted to the network administration unit TMN, and a 64 kbits/s user channel connection is then set up, in the form of a "silent call", between the relevant decentralized communications device RNT1...n and the network administration unit TMN. According to the invention, the feeder network device RCS is in this case granted access to the user channel connection which has been set up, in order to insert the temporarily stored program information sw'.

According to a second transmission variant, there is no need to define a new service type in order to carry out a software download. The process of setting up the connection, controlled by the network administration unit TMN, between the decentralized communications device RNT1...n and the network administration unit TMN for transmitting the updated program information sw' which is temporarily stored in the feeder network device RCS is dealt with like an outgoing call by the WLL feeder system ACCESS in the second transmission variant. In order to initiate the transmission of the program information sw' which is temporarily stored in the feeder network device RCS to the respective decentralized communications device RNT1...n, the network administration unit TMN transmits information which indicates a software download, via the feeder network access device RDU and via the feeder network device RCS, to the relevant decentralized communications device RNT1...n. This is done, for example, by setting up an OW channel connection to the respective decentralized communications device RNT1...n, if such a channel has not already been set up as a result of the transmission of additional signaling information.

After receiving the information which indicates a software download, the relevant decentralized communications device RNT1...n checks whether the transmission resources which are required for a software download are currently available or, for example, are being used by a user channel connection which is currently taking place via the air interface. In the situation where the required transmission resources are currently not available, the decentralized communications device RNT1...n transmits an appropriate negative acknowledgment via the feeder device ZE to the network administration unit TMN. When the network administration unit TMN receives a negative confirmation, the software downloading process which has been initiated is interrupted by the network administration unit TMN, and is started again at some later time. In the situation where the transmission capacities required for a software download are currently available, the relevant decentralized communications device RNT1...n requests, in the course of a regular connection request - "Call Setup" - a 64 kbits/s user channel connection, or a B-channel connection, via the air interface and via the feeder device to the network administration unit TMN, in the form of a "silent call". According to the invention, the requested user channel connection is set up in such a way that the feeder network device RCS is granted access to the user channel connection which has been set up, in order to insert the temporarily stored program information sw.

After setting up the connection, which is required for the software download, between the relevant decentralized communications device RNT1...n and the network administration unit TMN using the first or second transmission variant, the program information sw' which is temporarily stored in the feeder network device RCS is transmitted in segments, that is to say in the form of data packets, in the B-channel connection, via the air interface to the respective decentralized communications device RNT1...n, depending on the respectively chosen segment size. The relevant decentralized communications device RNT1...n uses an error identification routine - for example calculation of the checksum - to check the received data packets. If it is found that

a data packet has been received without any errors, a corresponding confirmation message is transmitted to the network administration unit TMN, and the received data packet is stored in the memory MEM. The memory MEM which is arranged in the individual decentralized communications devices RNT1...n may, for example, be in the form of EPROM.

The confirmation messages which are produced for data packets which have been received without any errors are advantageously transmitted to the feeder network device RCS via the 64 kbits/s B-channel connection which was set up. Once all the program information sw' has been transmitted without any errors to the respective decentralized communications device RNT1...n, information which indicates that the software downloading process has been successful and has been free of errors is transmitted from the feeder network device RCS to the network administration unit TMN, and the B-channel connection set up for this purpose is cleared.

Once a software updating process has been carried out successfully for a decentralized communications device RNT1...n, that is to say once the transmitted program information sw has been stored in the memory MEM in the respective decentralized communications device RNT1...n and once the B-channel connection which was set up for this purpose has been cleared, the control program which is represented by the stored program information sw is started. This is done, for example, by restarting or resetting the respective decentralized communications device RNT1...n, once the B-channel connection has been cleared. Once a restart has been carried out, an appropriate message is advantageously transmitted to the network administration unit TMN. When the network administration unit TMN receives information which indicates that the respective decentralized communications device RNT1...n has been successfully restarted, the software downloading process which was carried out for the respective decentralized communications device RNT1...n is regarded as being complete.

In order to minimize the occurrence of transmission errors during

the transmission of the data packets from the feeder network device RCS via the air interface to the respective decentralized communications device RNT1...n, a forward error correction "FEC" method can advantageously be implemented.

A further advantage of the refinement variant of the software downloading process illustrated in Figure 4 comprises the capability to transmit information which represents, for example, the progress of the software downloading process via the bidirectional connection, which was set up for the software downloading process, between the respective decentralized communications device RNT1...n and the network administration unit TMN, from the respective decentralized communications device RNT1...n to the network administration device TMN.

In order to shorten the time interval which a decentralized communications device RNT1...n in each case requires for a software downloading process, the segment size of the data packets which are used for transmitting the updated program information sw can advantageously be set to the maximum possible value, for example 24 kbytes.

In order to further shorten the respective time interval required for a software download, the current program information sw is stored in compressed form in the network administration unit TMN. An appropriate decompression method must be implemented in the respective decentralized communications devices RNT1...n in order to decompress the compressed program information sw which is transmitted to the respective decentralized communications devices RNT1...n.

It should be mentioned that the method according to the invention can be used for transmitting program and/or operating information, which is stored centrally in a communications network, in any type of wire-based, wireless, wire-free or cordless communications networks to decentralized communications devices connected to them. Thus, for example, settop boxes (RNT1...n) which are arranged in a wire-based multimedia communications network can be

regularly updated with the latest software version with little time required, in the course of OAM functionalities.

Patent Claims

1. A method for transmitting program and/or operating information (sw) which is stored centrally in a communications network (ACCESS), via at least one feeder device (ZE) to a number of decentralized communications devices (RNT1...n) which can be connected to the feeder device (ZE),

characterized

in that the program and/or operating information (sw) which is transmitted to the feeder device (ZE) is inserted into broadcast transmission messages, which are transmitted to the decentralized communications devices (RNT1...n) via at least one broadcast transmission channel (SBCH) and are transmitted to the decentralized communications devices (RNT1...n), with the program and/or operating information (sw) being matched in the communications network (ACCESS) or in the feeder device (ZE) to the transmission characteristics of the at least one broadcast transmission channel (SBCH).

2. The method for transmitting program and/or operating information (sw) which is stored centrally in a communications network (ACCESS), via at least one feeder device (ZE) to a number of decentralized communications devices (RNT1...n) which can be connected to the feeder device (ZE),

characterized

- in that the program and/or operating information (sw) is transmitted to the at least one feeder device (ZE) and is temporarily stored in it, and
- in that the program and/or operating information (sw') which is temporarily stored in the at least one feeder device (ZE) is transmitted to the decentralized communications devices (RNT1...n).

3. The method as claimed in claim 1 or 2,

characterized

in that the program and/or operating information (sw) which is transmitted to the decentralized communications devices (RNT1...n) is stored in the decentralized communications devices (RNT1...n).

4. The method as claimed in claim 2 or 3,
characterized
in that the temporarily stored program and/or operating information (sw') is transmitted via point-to-point connections or via at least one point-to-multipoint connection, to the decentralized communications devices (RNT1...n).

5. The method as claimed in claim 4,
characterized
in that, in the case of a point-to-point or point-to-multipoint connection, the program and/or operating information (sw') is transmitted via one or more parallel user channels.

6. The method as claimed in claim 2 or 3,
characterized
in that the temporarily stored program and/or operating information (sw') is transmitted to the decentralized communications devices (RNT1...n) by means of broadcast transmission messages which are transmitted to the decentralized communications devices (RNT1...n) via at least one broadcast transmission channel (SBCH).

7. The method as claimed in one of the preceding claims,
characterized
in that the program and/or operating information (sw) is transmitted to the feeder unit (ZE) from a network administration unit (TMN) which is arranged centrally in the communications network (ACCESS).

8. The method as claimed in claim 7,
characterized

in that the temporarily stored program and/or operating information (sw') is transmitted to the decentralized communications devices (RNT1...n) in each case controlled by the network administration unit (TMN).

9. The method as claimed in one of the preceding claims,
characterized
in that at least one control program, which is represented by the program information (sw, sw'), is initialized after storage in the respective decentralized communications device (RNT1...n).

10. The method as claimed in claim 7 or 8,
characterized
in that at least one control program, which is represented by the program information (sw, sw'), is in each case initialized, after being stored in the decentralized communications devices (RNT1...n), for each decentralized communications device (RNT1...n), controlled by the network administration unit (TMN).

11. The method as claimed in claim 9 or 10,
characterized
in that information which indicates the initialization of the control program is transmitted from the decentralized communications devices (RNT1...n) to the network administration unit (TMN).

12. The method as claimed in one of the preceding claims,
characterized
in that the feeder device (ZE) comprises at least one feeder network access device (RDU) and at least one feeder network device (RCS) which is connected to them via at least one user channel and at least one signaling channel.

13. The method as claimed in claim 12,
characterized
in that the program and/or operating information (sw) is

temporarily stored in the feeder network access device (RDU) or in the feeder network device (RCS), and is transmitted from there to the decentralized communications devices (RNT1...n).

14. The method as claimed in claim 12 or 13,
characterized
in that the program and/or operating information (sw, sw') is transmitted via at least one user channel from the feeder network access device (RDU) to the at least one feeder network device (ZE).

15. The method as claimed in one of claims 12 to 14,
characterized
- in that the at least one feeder network device (RCS) and the decentralized communications devices (RNT1...n) are in the form of wireless devices, and
- in that the wireless, decentralized communications devices (RNT1...n) and the at least one wireless feeder network device (RCS) can be connected to one another via a wireless transmission medium (FK) which has at least one user channel and at least one signaling or broadcast transmission channel (SBCH).

16. The method as claimed in claim 15,
characterized
in that the program and/or operating information (sw') which is temporarily stored in the wireless feeder network device (RCS) is transmitted to the decentralized, wireless communications devices (RNT1...n)
- via at least one user channel in the wireless transmission medium (FK), in each case in the course of a point-to-point or point-to-multipoint connection, or
- by means of broadcast transmission messages which are transmitted via the broadcast transmission channel (SBCH) in the wireless transmission medium (FK).

17. The method as claimed in claim 16,

characterized

in that the process of setting up the point-to-point connections or the at least one point-to-multipoint connection for transmitting the program and/or operating information (sw, sw') is controlled by the network administration unit (TMN).

18. The method as claimed in one of claims 15 to 17,
characterized
in that the wireless transmission medium (FK) is provided for the purposes of a TDM-/TDMA- and/or FDMA and/or CDMA and/or OFDM transmission method -Orthogonal Frequency Division Multiplexing - or a combination of at least some of these transmission methods.

19. The method as claimed in claim 18,
characterized
in that the wireless devices (RCS, RNT1...n) and the transmission medium (FK) are designed
- in accordance with the international DECT Standard ETS 300 175, or
- in accordance with the GSM or UMTS Standard, or
- in accordance with a future mobile radio standard, or
- in accordance with a B-CDMA transmission method.

20. The method as claimed in one of claims 15 to 19,
characterized
in that the feeder network access device (RDU) is connected to a higher-level communications network.

21. The method as claimed in one of the preceding claims,
characterized
in that the program and/or operating information (sw, sw') is transmitted in segmented form or in a packet form to the decentralized communications devices (RNT1...n).

22. The method as claimed in one of the preceding claims,
characterized

in that the program and/or operating information (sw) is transmitted in compressed form to the decentralized communications devices (RNT1...n).

23. A communications arrangement having a central network administration unit (TMN), in which a memory (MEM) is arranged with program and/or operating information (sw) stored in it,

- having a feeder device (ZE) which is connected to the network administration unit (TMN),
- having transmission means, which are arranged in the network administration unit (TMN), for transmitting the stored program and/or operating information (sw) to the feeder device (ZE),
- having a number of decentralized communications devices (RNT1...n) which can be connected to the feeder device (ZE), and
- having memories (MEM), which are in each case arranged in the decentralized communications devices (RNT1...n), for storing the program and/or operating information (sw),

characterized

- in that insertion means for inserting the transmitted program and/or operating information (sw) into broadcast transmission messages which are transmitted to the decentralized communications devices (RNT1...n) via at least one broadcast transmission channel (SBCH) are arranged in the feeder device (ZE), and
- in that the transmission means which are arranged in the network administration unit (TMN) are designed such that the program and/or operating information (sw) is matched to the transmission characteristics of the at least one broadcast transmission channel (SBCH).

24. A communications arrangement having a central network administration unit (TMN), in which a memory (MEM) is arranged with program and/or operating information (sw) stored in it,

- having a feeder device (ZE) which is connected to the

network administration unit (TMN),

- having transmission means, which are arranged in the network administration unit (TMN), for transmitting the stored program and/or operating information (sw) to the feeder device (ZE),
- having a number of decentralized communications devices (RNT1...n) which can be connected to the feeder device (ZE), and
- having memories (MEM), which are in each case arranged in the decentralized communications devices (RNT1...n), for storing the program and/or operating information (sw),

characterized

- in that a buffer store (ZM) is provided in the feeder device (ZE), for temporary storage of the program and/or operating information (sw) which is transmitted to the feeder device (ZE), and
- in that the feeder unit (ZE) has transmission means for transmitting the temporarily stored program and/or operating information (sw') to the decentralized communications devices (RNT1...n).

25. The communications arrangement as claimed in claim 24,

characterized

in that the transmission means which are arranged in the feeder unit (ZE) are designed such that the temporarily stored program and/or operating information (sw') is transmitted to the decentralized communications devices (RNT1...n)

- in the course of point-to-point connnections or in the course of at least one point-to-multipoint connection, or
- by means of broadcast transmission messages which are transmitted to the decentralized communications devices (RNT1...n) via at least one broadcast transmission channel (SBCH).

26. The communications arrangement as claimed in claims 24 and 25,

characterized

in that the feeder device (ZE) comprises at least one feeder network access device (RDU) and at least one feeder network device (RCS) which is connected to them via at least one user channel and at least one signaling channel.

GR 99 P 2200

Abstract

Method for transmitting program and/or operating information, which is stored centrally in a communications network, to a number of decentralized communications devices

Program and/or operating information (sw) which is updated and is stored centrally in a communications network (ACCESS) is transmitted to a feeder device (ZE), in which it is temporarily stored, and is then transmitted to a number of decentralized communications devices (RNT1...n).
Alternatively, the program information (sw) is transmitted to the decentralized communications devices (RNT1...n) by means of broadcast transmission messages, without any temporary storage. This advantageously results in a considerable reduction in the time involved in carrying out a software update within the communications network (ACCESS).

Figure 4

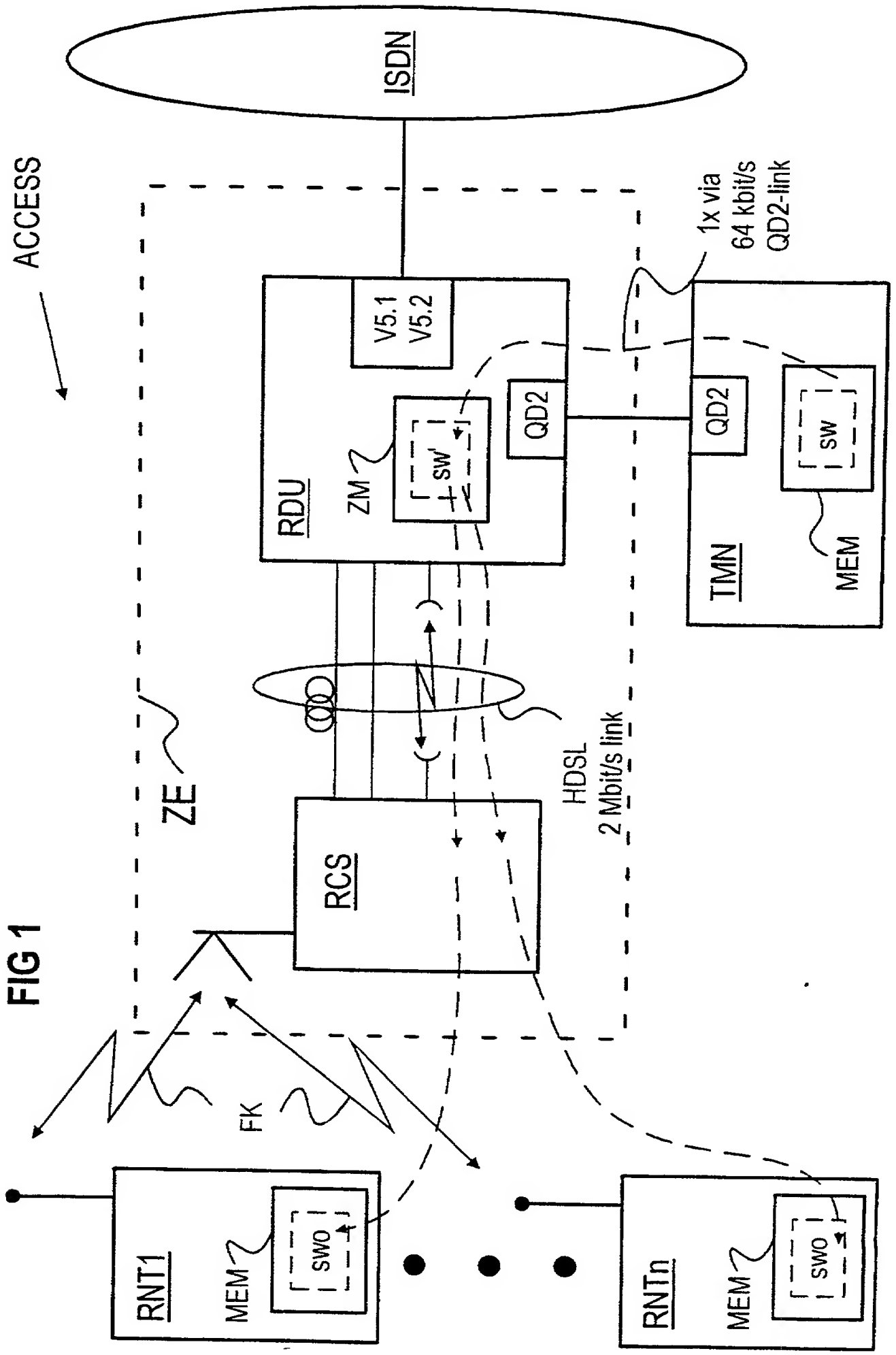

ISDN
ACCESS
1x via
64 kbit/s
QD2-link
V5.1
V5.2
RDU
ZM
SW
QD2
QD2
SW
TMN
MEM
ZE
HDSL
2 Mbit/s link
RCS
FK
RNT1
MEM
SWO
RNTn
MEM
SWO

FIG 1

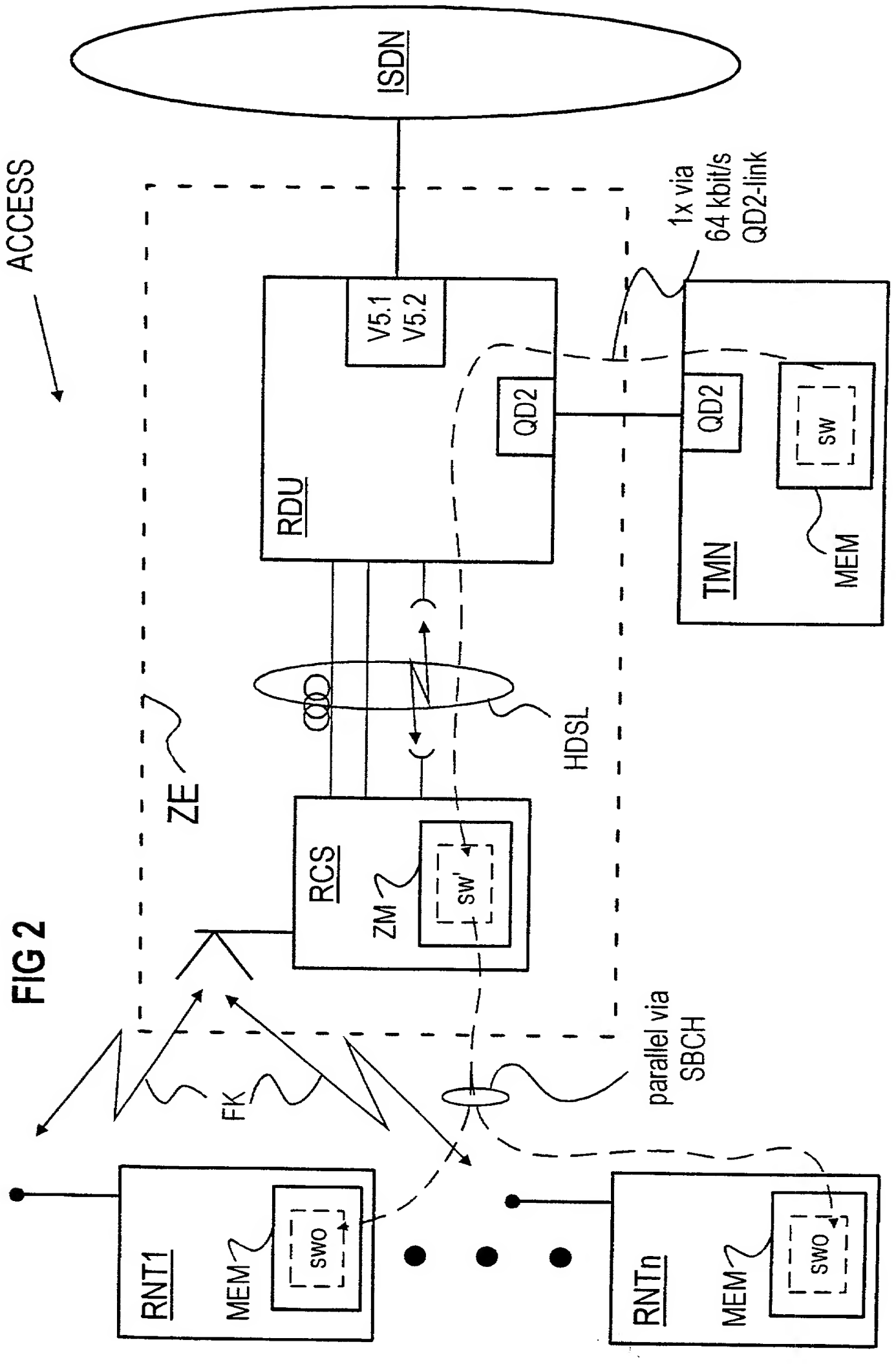
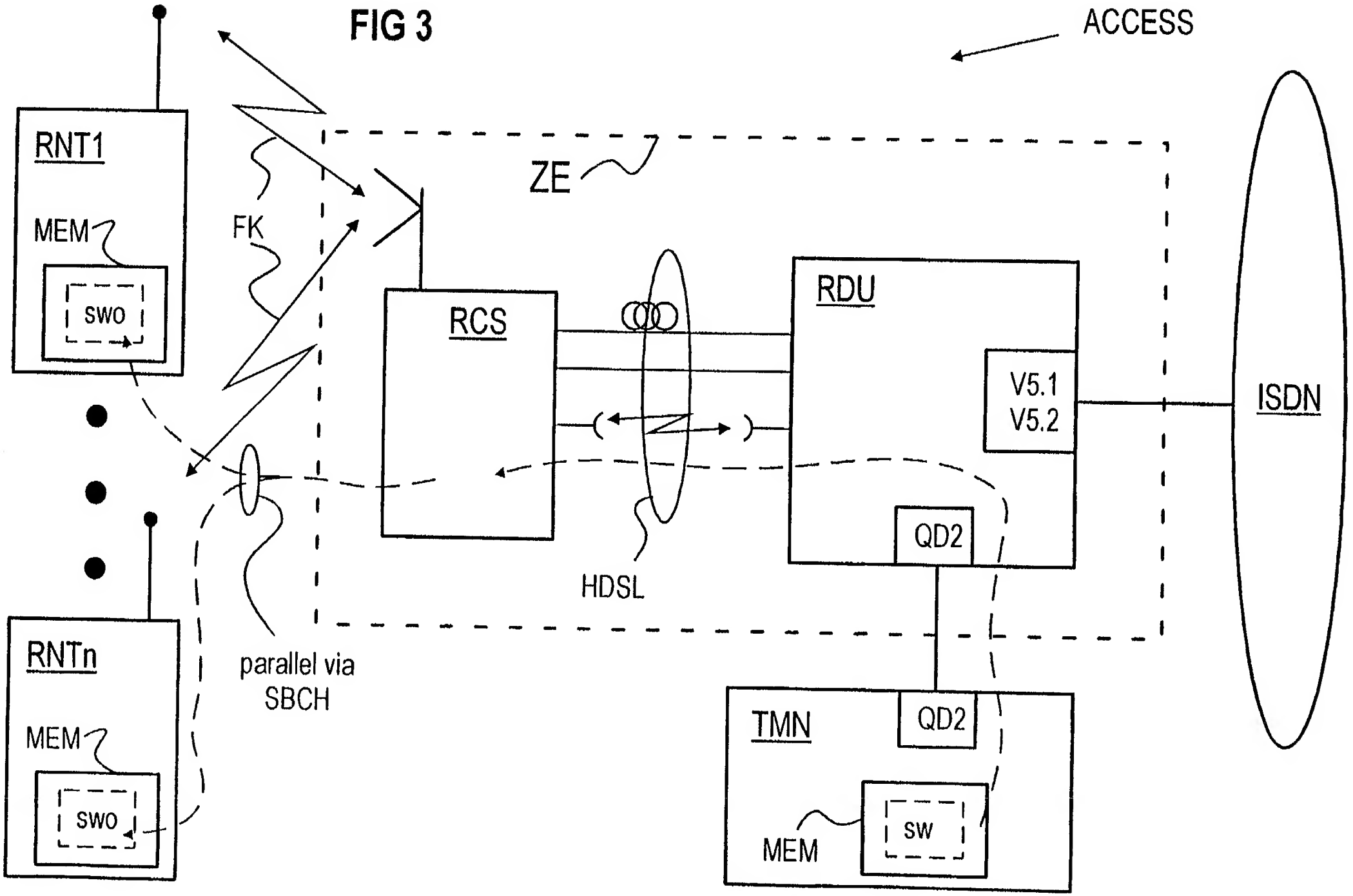

ISDN
ACCESS
1x via
64 kbit/s
QD2-link
V5.1
V5.2
QD2
QD2
SW
RDU
TMN
MEM
ZE
HDSL
RCS
ZM
SW'
FK
parallel via
SBCH
RNT1
MEM
SWO
RNTn
MEM
SWO

FIG 2

FIG 3



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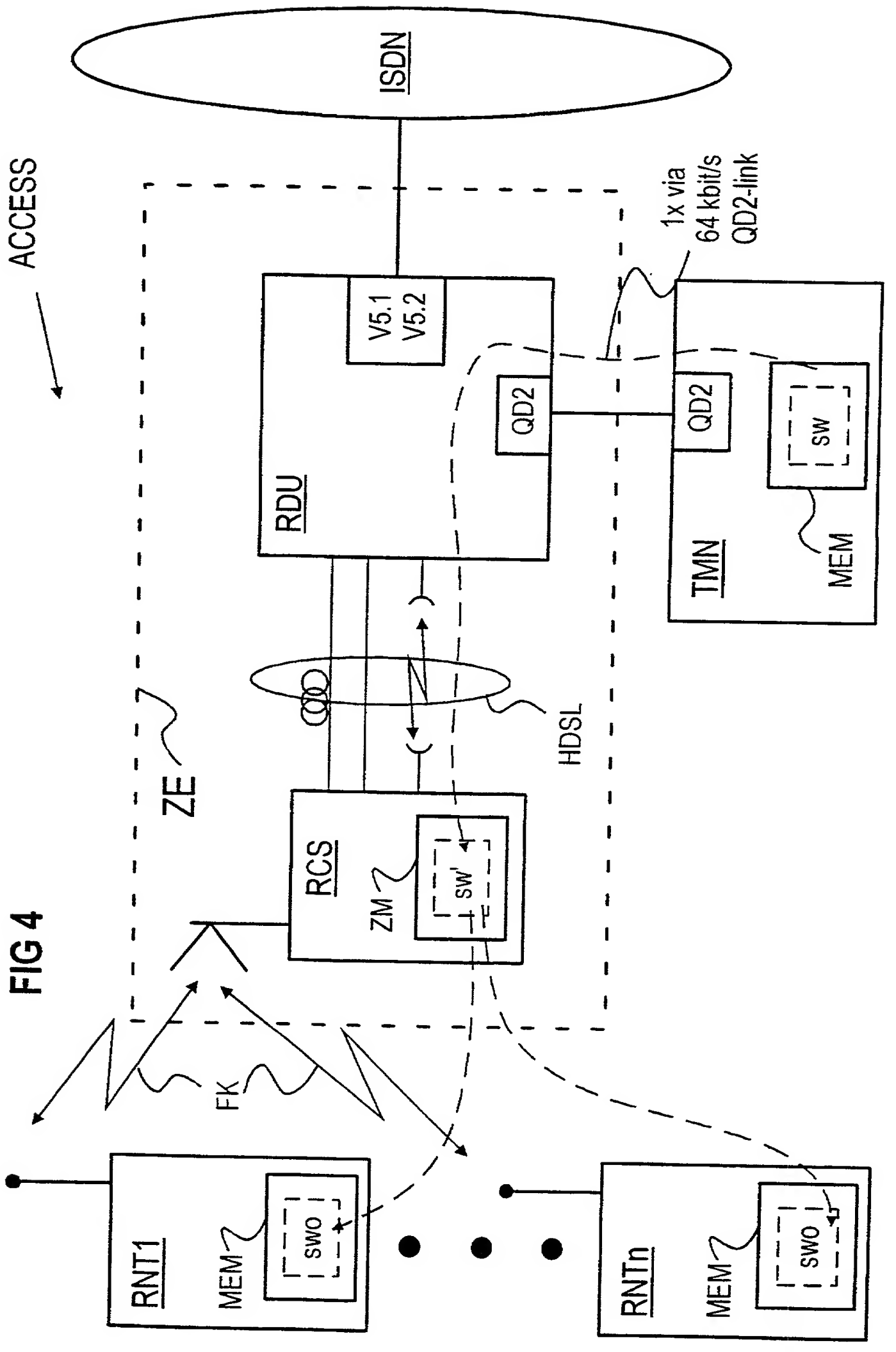
ISDN
ACCESS
1x via
64 kbit/s
QD2-link
V5.1
V5.2
QD2
QD2
SW
RDU
TMN
MEM
HDSL
ZE
RCS
ZM
SW'
FK
RNT1
MEM
SWO
RNTn
MEM
SWO

FIG 4

#5 Petition 3-13-02

S&H Form: PTO/SB/17 (2001)

RESPONSE TO NOTIFICATION OF MISSING REQUIREMENTS		
	Attorney Docket No.	1454.1213
	Application Number	10/019,480
	Filing Date	
	First Named Inventor	Arnulf DEINZER et al.
	Group Art Unit	To be assigned

Title:	METHOD OF TRANSMITTING PROGRAM AND/OR OPERATIONAL INFORMATION THAT IS CENTRALLY STORED IN A COMMUNICATION NETWORK TO SEVERAL DECENTRALIZED COMMUNICATION DEVICE

Pursuant to 37 C.F.R. § 1.53(f) and in response to the U.S. Patent and Trademark Office Notice to File Missing Parts of Nonprovisional Application mailed March 12, 2002 for the above-identified application, enclosed are the following:

☒ RETURN COPY of Notice to File Missing Parts of Nonprovisional Application

☒ Executed Combined Declaration/Power of Attorney executed by the inventor for completing the missing parts of the subject application. The undersigned registered attorney states that the subject application is the application which the inventor executed by signing the attached Declaration.

☐ Formal Drawings (__Sheets; Figs _____)

☐ English-language translation of application (with Translator's Statement (pages __))

☐ Verified Statement Claiming Small Entity Status

Enclosed is a payment of the following:

☐ The filing fee as set forth in 37 C.F.R. § 1.16(a)	$
☐ The additional claim(s) fee (claims over 20)	$
☐ The additional independent claim(s) fee (claims over 3)	$
☐ Multiple dependent claims	$
☐ Petition for Extension of Time (__-month)	$
☐ English language translation fee	$
☒ Surcharge as set forth in 37 C.F.R. § 1.16(e)	$130.00
SUBTOTAL FEES:	$130.00
☐ Reduction by 50% for filing by small entity (37 CFR 1.27)	.00
SUBTOTAL FEES:	$130.00

03/25/2002 HNGUYEN 00000120 10019480
01 FC:154 130.00 DP

TOTAL FEES DUE:	$130.00

Declaration and Power of Attorney For Patent Application
Erklärung Für Patentanmeldungen Mit Vollmacht
German Language Declaration

Als nachstehend benannter Erfinder erkläre ich hiermit an Eides Statt:

As a below named inventor, I hereby declare that:

dass mein Wohnsitz, meine Postanschrift, und meine Staatsangehörigkeit den im Nachstehenden nach meinem Namen aufgeführten Angaben entsprechen,

My residence, post office address and citizenship are as stated below next to my name,

dass ich, nach bestem Wissen der ursprüngliche, erste und alleinige Erfinder (falls nachstehend nur ein Name angegeben ist) oder ein ursprünglicher, erster und Miterfinder (falls nachstehend mehrere Namen aufgeführt sind) des Gegenstandes bin, für den dieser Antrag gestellt wird und für den ein Patent beantragt wird für die Erfindung mit dem Titel:

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled

Verfahren zum Übermitteln von zentral in einem Kommunikationsnetz gespeicherten Programm- und/oder Betriebsinformationen an mehrere dezentrale Kommunikationseinrichtungen

Method of transmitting program and/or operational information that is centrally stored in a communication network to several decentralized communication devices

deren Beschreibung

(zutreffendes ankreuzen)
☐ hier beigefügt ist.
☒ am 28.06.2000 als
PCT internationale Anmeldung
PCT Anmeldungsnummer PCT/DE00/02109
eingereicht wurde und am _____
abgeändert wurde (falls tatsächlich abgeändert).

the specification of which

(check one)
☐ is attached hereto.
☒ was filed on 28.06.2000 as
PCT international application
PCT Application No. PCT/DE00/02109
and was amended on _____
(if applicable)

Ich bestätige hiermit, dass ich den Inhalt der obigen Patentanmeldung einschliesslich der Ansprüche durchgesehen und verstanden habe, die eventuell durch einen Zusatzantrag wie oben erwähnt abgeändert wurde.

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims as amended by any amendment referred to above.

Ich erkenne meine Pflicht zur Offenbarung irgendwelcher Informationen, die für die Prüfung der vorliegenden Anmeldung in Einklang mit Absatz 37, Bundesgesetzbuch, Paragraph 1.56(a) von Wichtigkeit sind, an.

I acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, §1.56(a).

Ich beanspruche hiermit ausländische Prioritätsvorteile gemäss Abschnitt 35 der Zivilprozessordnung der Vereinigten Staaten, Paragraph 119 aller unten angegebenen Auslandsanmeldungen für ein Patent oder eine Erfindersurkunde, und habe auch alle Auslandsanmeldungen für ein Patent oder eine Erfindersurkunde nachstehend gekennzeichnet, die ein Anmeldedatum haben, das vor dem Anmeldedatum der Anmeldung liegt, für die Priorität beansprucht wird.

I hereby claim foreign priority benefits under Title 35, United States Code, §119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

German Language Declaration

Prior foreign appplications Priorität beansprucht			Priority Claimed	
19930170.0 (Number) (Nummer)	DE (Country) (Land)	30.06.1999 (Day Month Year Filed) (Tag Monat Jahr eingereicht)	☒ Yes Ja	☐ No Nein
(Number) (Nummer)	(Country) (Land)	(Day Month Year Filed) (Tag Monat Jahr eingereicht)	☐ Yes Ja	☐ No Nein
(Number) (Nummer)	(Country) (Land)	(Day Month Year Filed) (Tag Monat Jahr eingereicht)	☐ Yes Ja	☐ No Nein

Ich beanspruche hiermit gemäss Absatz 35 der Zivilprozessordnung der Vereinigten Staaten, Paragraph 120, den Vorzug aller unten aufgeführten Anmeldungen und falls der Gegenstand aus jedem Anspruch dieser Anmeldung nicht in einer früheren amerikanischen Patentanmeldung laut dem ersten Paragraphen des Absatzes 35 der Zivilprozeßordnung der Vereinigten Staaten, Paragraph 122 offenbart ist, erkenne ich gemäss Absatz 37, Bundesgesetzbuch, Paragraph 1.56(a) meine Pflicht zur Offenbarung von Informationen an, die zwischen dem Anmeldedatum der früheren Anmeldung und dem nationalen oder PCT internationalen Anmeldedatum dieser Anmeldung bekannt geworden sind.

I hereby claim the benefit under Title 35. United States Code. §120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, §122, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, §1.56(a) which occured between the filing date of the prior application and the national or PCT international filing date of this application.

PCT/DE00/02109 (Application Serial No.) (Anmeldeseriennummer)	28.06.2000 (Filing Date D, M, Y) (Anmeldedatum T, M, J)	anhängig (Status) (patentiert, anhängig, aufgegeben)	pending (Status) (patented, pending, abandoned)
_____ (Application Serial No.) (Anmeldeseriennummer)	(Filing Date D,M,Y) (Anmeldedatum T, M; J)	_____ (Status) (patentiert, anhängig, aufgeben)	(Status) (patented, pending, abandoned)

Ich erkläre hiermit, dass alle von mir in der vorliegenden Erklärung gemachten Angaben nach meinem besten Wissen und Gewissen der vollen Wahrheit entsprechen, und dass ich diese eidesstattliche Erklärung in Kenntnis dessen abgebe, dass wissentlich und vorsätzlich falsche Angaben gemäss Paragraph 1001, Absatz 18 der Zivilprozessordnung der Vereinigten Staaten von Amerika mit Geldstrafe belegt und/oder Gefängnis bestraft werden koennen, und dass derartig wissentlich und vorsätzlich falsche Angaben die Gültigkeit der vorliegenden Patentanmeldung oder eines darauf erteilten Patentes gefährden können.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true, and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

German Language Declaration

VERTRETUNGSVOLLMACHT: Als benannter Erfinder beauftrage ich hiermit den nachstehend benannten Patentanwalt (oder die nachstehend benannten Patentanwälte) und/oder Patent-Agenten mit der Verfolgung der vorliegenden Patentanmeldung sowie mit der Abwicklung aller damit verbundenen Geschäfte vor dem Patent- und Warenzeichenamt: *(Name und Registrationsnummer anführen)*

POWER OF ATTORNEY: As a named inventor, I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith. *(list name and registration number)*

And I hereby appoint

Customer No. 21171

Telefongespräche bitte richten an: *(Name und Telefonnummer)*

Direct Telephone Calls to: *(name and telephone number)*

Ext. _____

Postanschrift:

Send Correspondence to:

Staas & Halsey LLP
700 Eleventh Street NW, Suite 500 20001 Washington, DC
Telephone: (001) 202 434 1500 and Facsimile (001) 202 434 1501
or
Customer No. 21171

Voller Name des einzigen oder ursprünglichen Erfinders:	Full name of sole or first inventor:
Dr. Arnulf Deinzer	Dr. Arnulf Deinzer 1-00
Unterschrift des Erfinders Datum	Inventor's signature Date
Arnulf Deinzer 19.12.2001	
Wohnsitz	Residence
München, DEUTSCHLAND	München, GERMANY DEX
Staatsangehörigkeit	Citizenship
DE	DE
Postanschrift	Post Office Addess
Forstenrieder Allee 128	Forstenrieder Allee 128
81476 München	81476 München
Voller Name des zweiten Miterfinders (falls zutreffend):	Full name of second joint inventor, if any:
HELMUT HEEKE	HELMUT HEEKE 2-00
Unterschrift des Erfinders Datum	Second Inventor's signature Date
Helmut Heeke 8.1.02	
Wohnsitz	Residence
MUENCHEN, DEUTSCHLAND	MUENCHEN, GERMANY DEX
Staatsangehörigkeit	Citizenship
DE	DE
Postanschrift	Post Office Address
RABENSTEINSTR. 1	RABENSTEINSTR. 1
81243 MUENCHEN	81243 MUENCHEN

(Bitte entsprechende Informationen und Unterschriften im Falle von dritten und weiteren Miterfindern angeben).

(Supply similar information and signature for third and subsequent joint inventors).